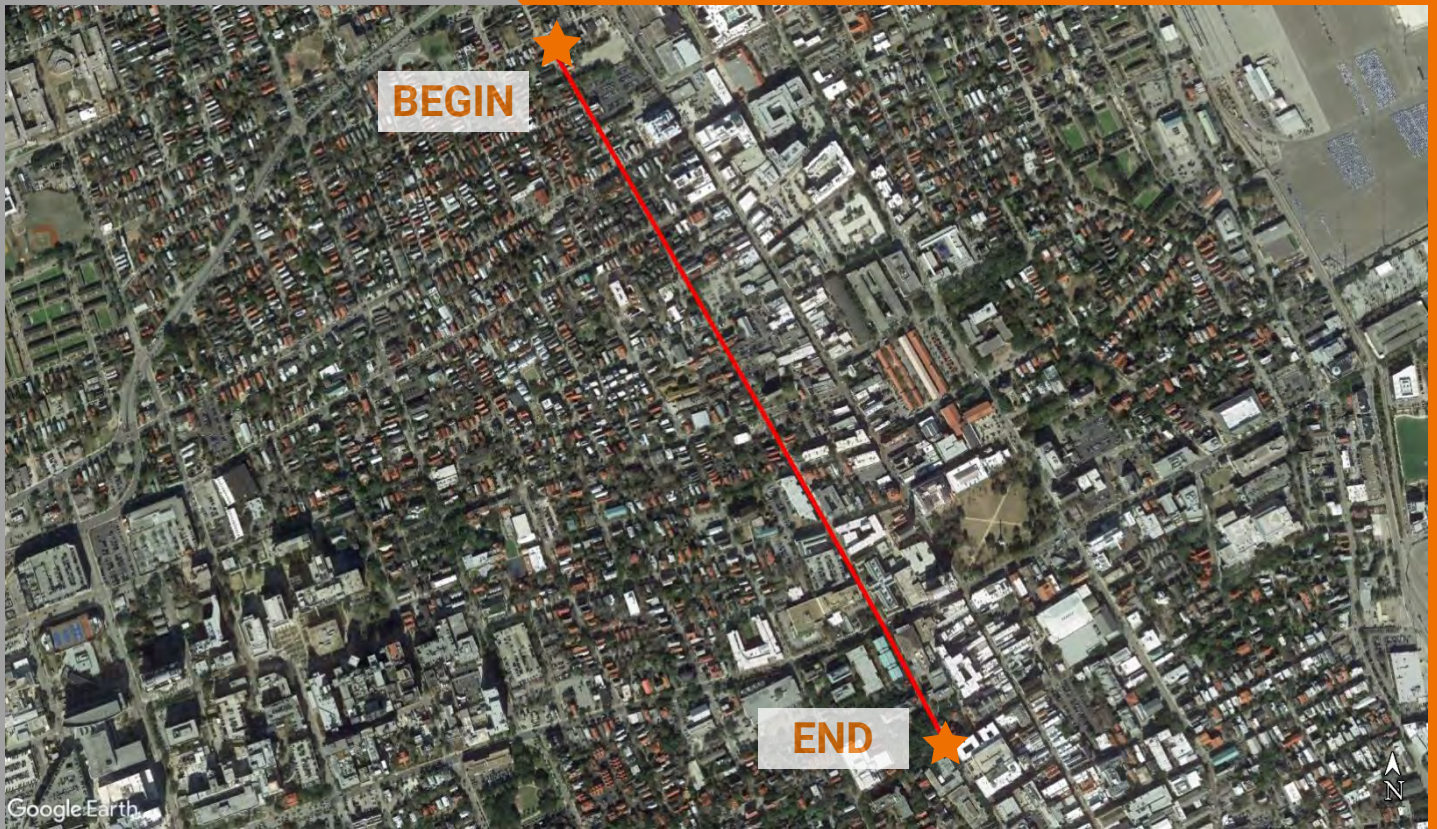


SAINT PHILIP STREET

Bicycle and Pedestrian Road Safety Audit Charleston, SC



JULY 2020



S-106 Saint Philip Street

Bicycle and Pedestrian Road Safety Audit

Charleston, South Carolina

Prepared for:

South Carolina Department of Transportation
(SCDOT)

Prepared by:

Stantec Consulting Services Inc.

Project Number: 171002158

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1.0 INTRODUCTION

1.1 Background

Effective bicycle and pedestrian programs often consider the six “Es”:

- Evaluation – Review and analysis of crash data and information from surveys, walking audits, and other research to determine strategies for improving safety
- Engineering – Design of physical infrastructure to improve safety
- Enforcement – Engagement of law enforcement to patrol problem locations and increase community awareness of safety issues
- Education – Methods to teach motorists and pedestrians about their responsibilities and traffic rules
- Encouragement – Strategies that develop awareness and build enthusiasm for cycling and walking
- Equity – Consideration for the diverse needs of all roadway users

This Bicycle and Pedestrian Road Safety Audit covers the first “E”, Evaluation. The RSA process identifies safety issues through an intensive and collaborative forum and uses brainstorming and local knowledge to enhance analysis findings in developing a range of improvement ideas. This RSA provides specific recommendations for Engineering, but also recognizes Enforcement, Education, Encouragement and Equity needs. A multi-disciplinary team performed the RSA, bringing a variety of perspectives to the study. Detailed crash data from the most recent six years along with extensive analyses was used to identify high crash patterns and/or rates throughout the study area to share with the study team.

1.2 Project Overview

In 2018, SCDOT identified S-106 (Saint Philip Street), as a high crash corridor involving non-motorized users, i.e. bicyclists and pedestrians. The corridor was #6 in the statewide ranking of SCDOT’s non-motorized safety project list, which was based on the total number of bike / pedestrian crashes per mile. Between 2013 and 2018, there were 12 crashes along S-106 involving bicycles and pedestrians. Of these 12 crashes, 11 resulted in injuries with no fatalities reported. 6 crashes involved bicycles and the remaining 6 involved pedestrians.

The study area is a 1.07-mile section of Saint Philip Street, which begins at Line Street and extends southward to George Street. Over the six-year period, 133 crashes have been reported along the study area, at a rate of approximately 22 crashes per year. Of the 133 crashes, 33 resulted in injuries and no fatalities were reported. The number and severity of these crashes warranted a closer evaluation for potential safety improvements for drivers, bicyclists and pedestrians.

The RSA process identifies safety issues through an intensive and collaborative forum and uses brainstorming and local knowledge to enhance analysis findings in developing a range of improvement ideas. A multi-disciplinary team performed the road safety audit, bringing a variety of perspectives to the study. Detailed crash data from the most recent six years, along with extensive analysis, was used to identify high crash patterns and/or rates throughout the study area to share with the study team.

1.3 Road Safety Assessment Interdisciplinary Team

A multidisciplinary team was formed to evaluate safety needs and identify the recommended improvements. The team consisted of engineers, law enforcement, and local municipality representatives. The team conducted field visits on March 2 and 3, 2020. The members of the RSA team were as follows:

- Shawn Salley – SCDOT
- Robert Amick – SCDOT
- Josh Johnson – SCDOT
- Adam Payne – SCDOT
- Sarah Cox – BCDCOG
- Belen Vitello – BCDCOG
- Michael Mathis – City of Charleston
- Keith Benjamin – City of Charleston
- Morgan Gundlach – City of Charleston
- Troy Mitchell - City of Charleston
- Robert Somerville – City of Charleston
- Kristy McFadden - Charleston PD
- Katie Zimmerman – Charleston Moves
- Savannah Brennan – Charleston Moves
- Regina Creech – MUSC
- Kathy Papadimitriou – Ronald McDonald House
- Dennis Frazier – Charleston Medical District
- Mark Berry – College of Charleston
- Bret Gillis – Stantec Consulting Services
- Chris Cook – Stantec Consulting Services
- Stuart Day – Stantec Consulting Services
- Nabarjun Vashisth – Stantec Consulting Services

1.4 Report Objectives

The purpose of this Road Safety Assessment is to evaluate safety issues and other areas of concern along S-106 between Line Street and George Street, including the intersections located along the route. The study identifies opportunities for improving bicycle, pedestrian and vehicular safety.

The assessment has three basic components:

- Pre-assessment

- Analyze crash data – Crash data over a six-year period were analyzed, with results based on different crash types and trends depicted through various charts, tables and spreadsheets.
- Speed Study - Conduct speed study of the corridor at 3 different locations to gauge average and 85th percentile speeds during non-rush hour traffic.
- The audit team reviews location characteristics and crash analysis
- Field meeting/Site visit
 - Study team gathers to review/discuss crash details and share local knowledge of existing issues and concerns.
 - Study team walks the corridor to examine conditions along the corridor.
- Post-assessment – The study team gathers to share findings and develop a list of issues and potential strategies.

2.0 EXISTING CONDITIONS

2.1 PROJECT LOCATION

The project study area begins at the intersection of Line Street in the northern end and extends southward to George Street. These limits are shown below in Figure 2.1. S-106 has active bicycle, pedestrian, vehicular, and transit traffic. It serves residential, office and retail properties, with several attractions for both tourists and local residents. The College of Charleston is also nearby, adding to nonvehicular and vehicular traffic when school is in session.

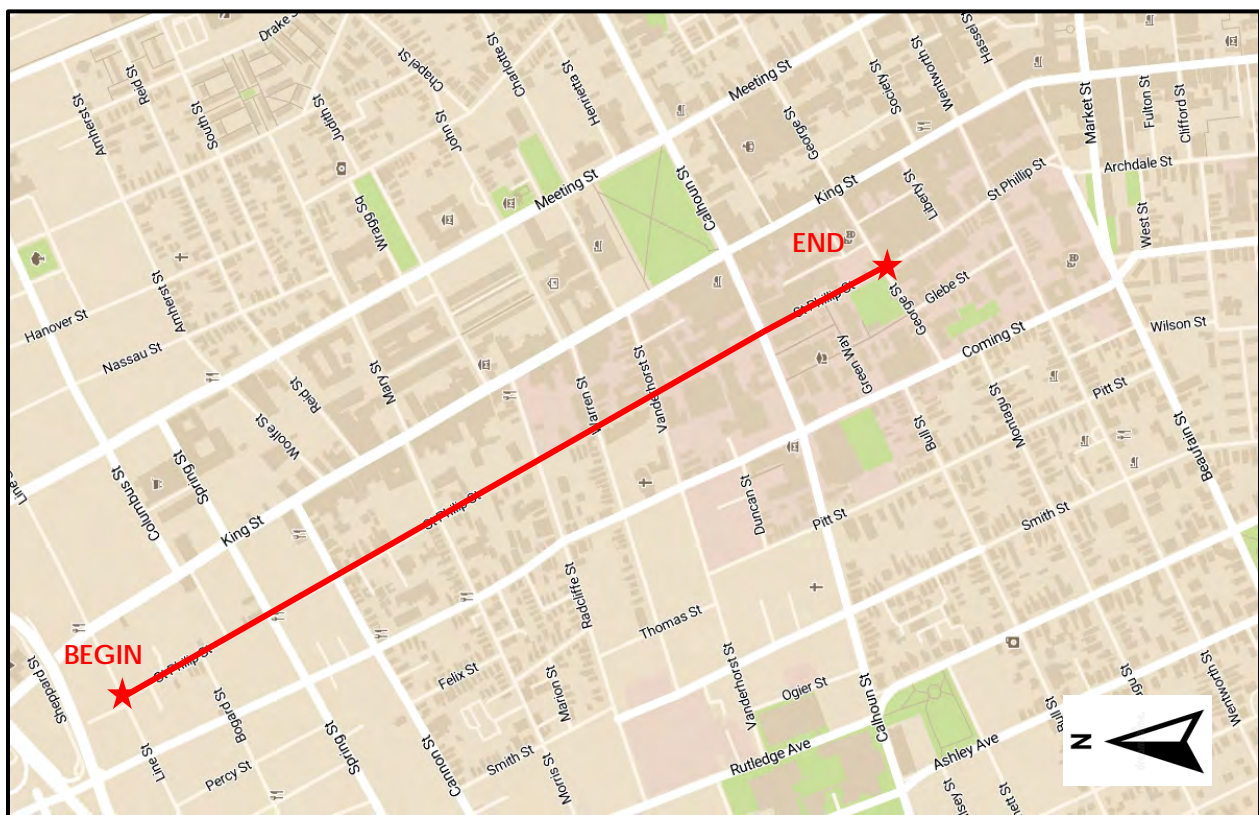


Figure 2.1- Project Study Area

2.2 EXISTING ROADWAYS

Saint Philip St. is a two-lane major collector that serves residential and commercial traffic. Southbound Saint Philip St. beyond the Calhoun St. intersection is one-way with two lanes. Through lanes, on-street parking, posted speeds, and 2019 ADT counts are mapped on the following pages. There are existing traffic signals at the intersections of Spring St., Cannon St., Morris St., Radcliffe St., Vanderhorst St., Calhoun

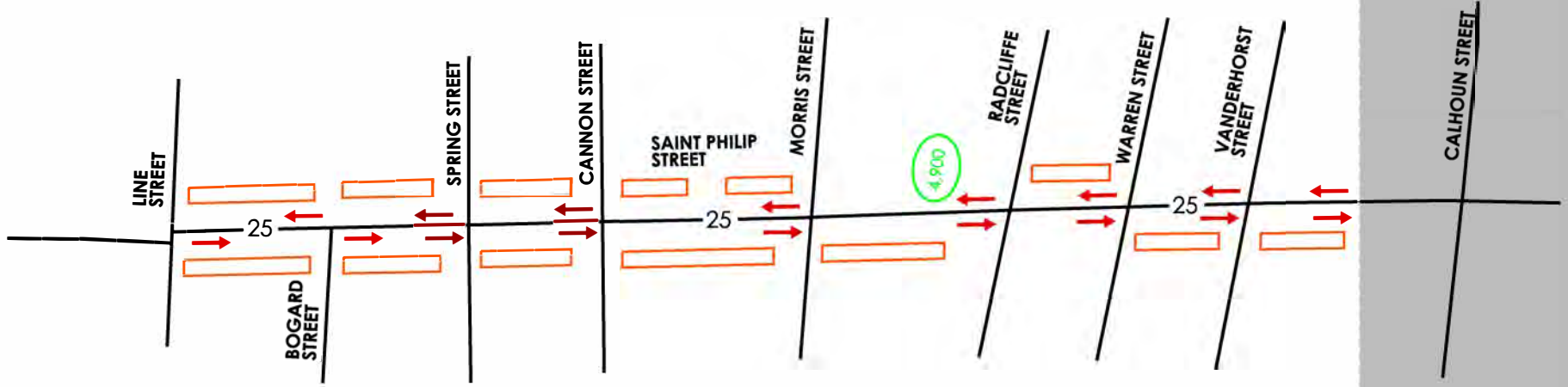
St., and George St. Sidewalk exists on both sides of the roadway, throughout the study area. Signalized pedestrian crossings along this corridor exist at each of the signalized intersections except for those at Morris Street and Radcliffe Street. Lane widths on S-106 vary from 10 to 12 feet.

Key intersections include:

- **Spring St.** is a two-lane (one-way) minor arterial in the north end of the study area. The posted speed limit is 25 mph. The 2019 AADT was 5,000 vpd.
- **Cannon St.** is a two-lane minor arterial in the north end of the study area. The posted speed limit is 25 mph. The 2019 AADT was 6,100 vpd.
- **Calhoun St.** is a four-lane principle arterial. The posted speed limit is 25 mph and the 2019 AADT was 15,800 vpd for this section of Calhoun Street.

SAINT PHILIP STREET TRAFFIC FEATURES

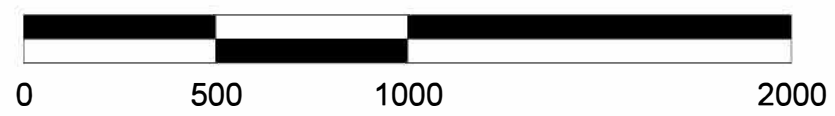
MATCHLINE A



LEGEND

- 25 — SPEED LIMIT ON SECTION (MPH)
- EXISTING THROUGH LANES
- ▭ EXISTING STREET PARKING
- 10,000 2019 AADT (VEHICLES PER DAY)

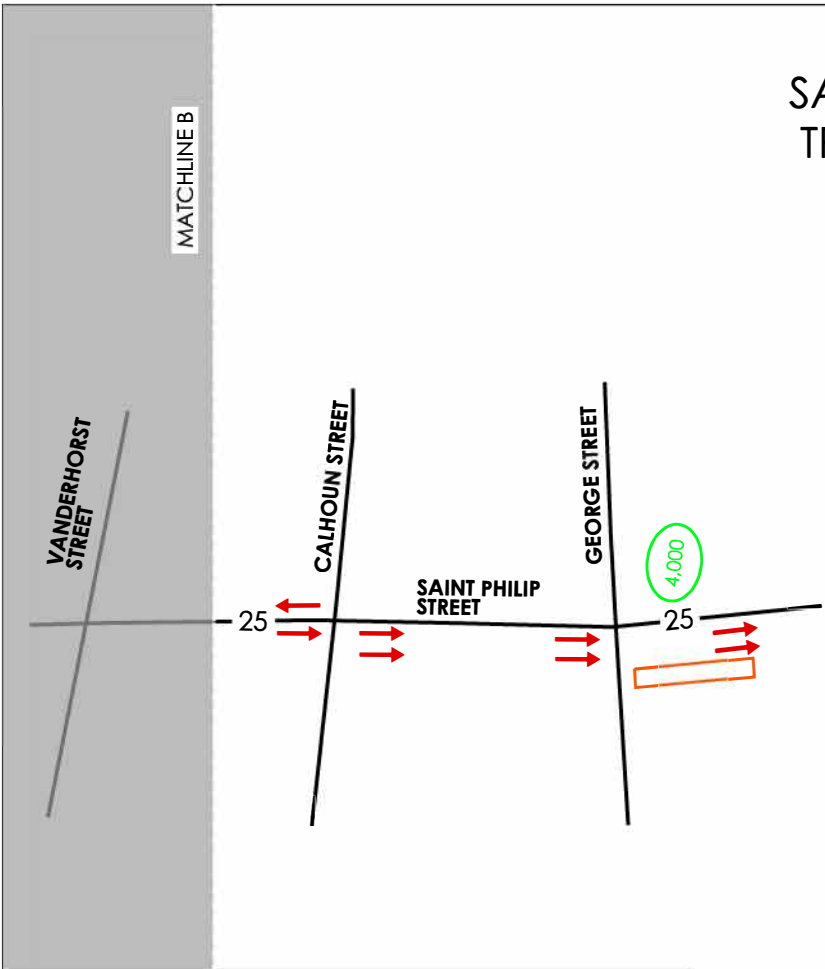
SCALE IN FEET



SHEET 1



SAINT PHILIP STREET TRAFFIC FEATURES



LEGEND

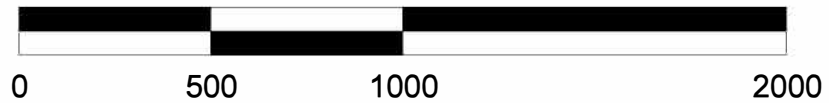
— 25 — SPEED LIMIT ON SECTION (MPH)

→ EXISTING THROUGH LANES

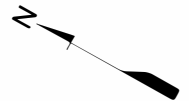
▭ EXISTING STREET PARKING

4,000 2019 AADT (VEHICLES PER DAY)

SCALE IN FEET



SHEET 2



2.3 CRASH DATA

Crash data for the study corridor was provided by SCDOT for a six-year period between January 2013 and December 2018. The crash data supplied by SCDOT was grouped into street blocks (from north to south), and then reviewed to identify trends in collision types and locations that experienced a high crash frequency. In total, there were 133 reported crashes along the entire route.

See summaries of the crash data in Figures 2.3.1-2.3.16 below, as well as in tabular form in Appendix A.

Note that the 2013-2018 time frames used in this section and Appendices A and B are different from the time frames used in Appendix C - Crash Diagrams - Specific Intersections and Appendix D - Bicycle and Pedestrian Crash Diagram. Appendix C uses a 1-1-2016 to 3-31-2019 time frame, while Appendix D uses a 1-1-12 to 3-31-2018 time frame.

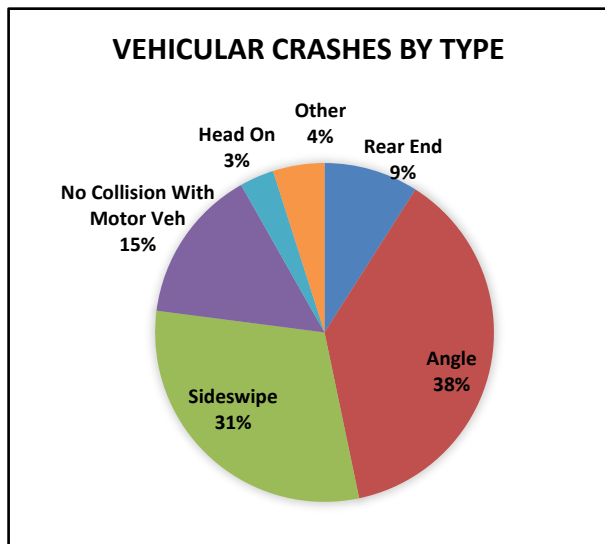


Figure 2.3.1- S-106 Crashes by Type

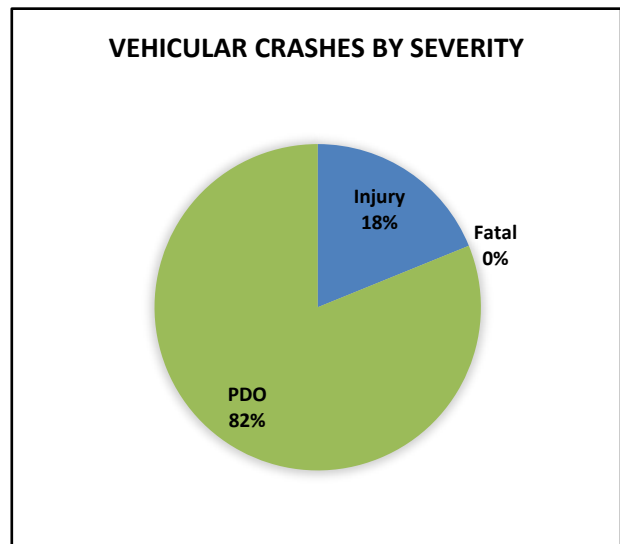


Figure 2.3.2 - S-106 Crashes by Severity

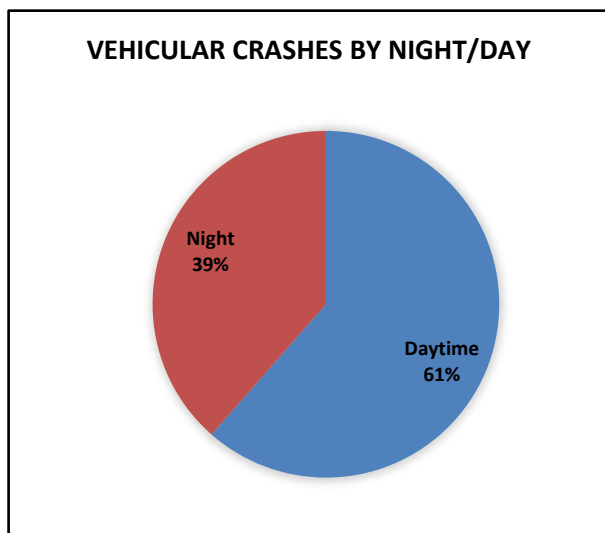


Figure 2.3.3 - S-106 Crashes by Day/Night

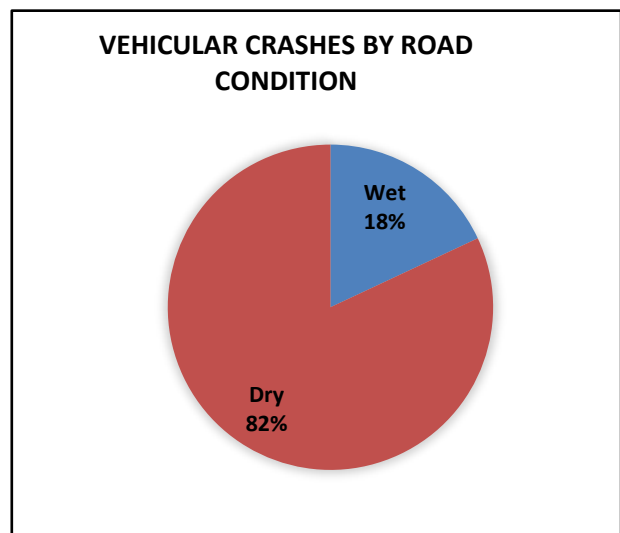


Figure 2.3.4 - S-106 Crashes by Road Condition

As seen in Figure 2.3.1, angle crashes are the most common type, at 38% of all vehicular crashes. Crashes designated as no collision with motor vehicle are typically collisions with a fixed object. Figure 2.3.2 depicts vehicular crashes by severity along the study area, which shows 18% of all crashes resulted in injuries. 82% of the crashes were reported to be property damage only (PDO). No fatal crashes were reported over the entire period. From Figure 2.3.3, 39% of all vehicular crashes occurred at night time.

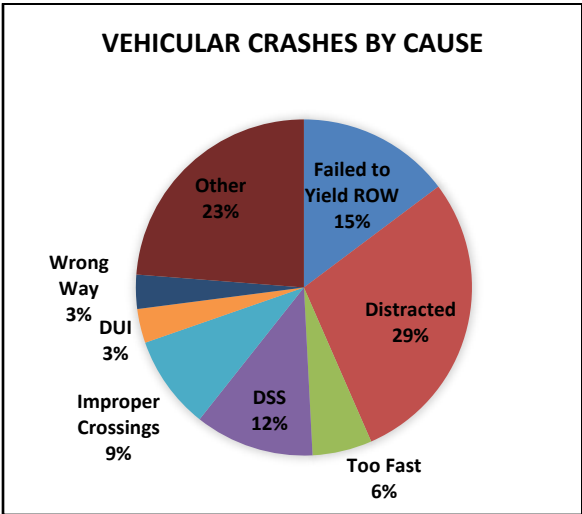


Figure 2.3.5 - S-106 Crashes by Cause

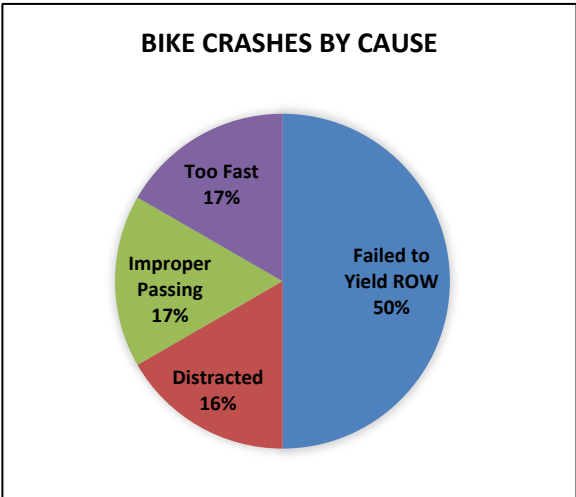


Figure 2.3.6 - S-106 Bicycle Crashes by Cause

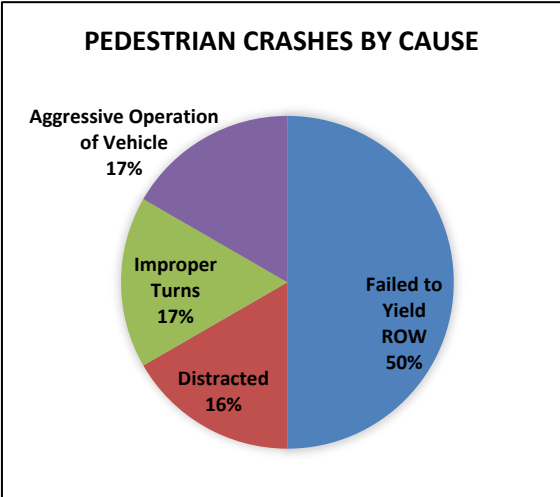


Figure 2.3.7 - S-106 Pedestrian Crashes by Cause

Figures 2.3.6 and 2.3.7 depict bicycle and pedestrian crashes by probable cause, respectively along the study area.

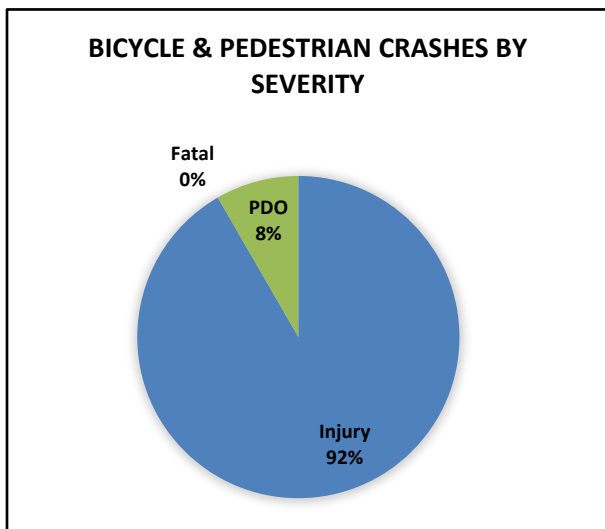


Figure 2.3.8 - S-106 Bicycle and Pedestrian Crashes by Severity

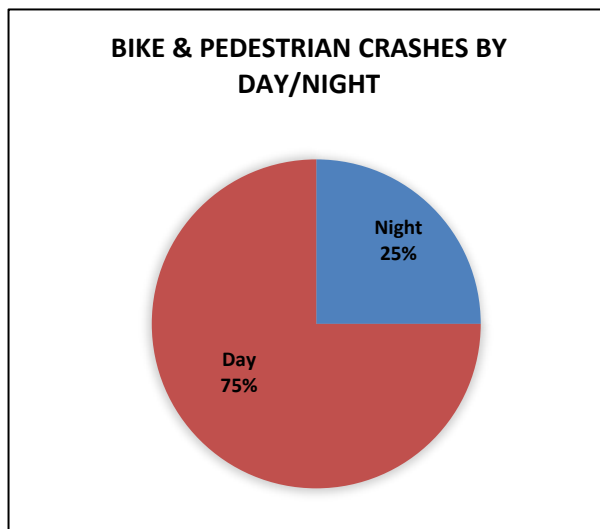


Figure 2.3.9 - S-106 Bicycle and Pedestrian Crashes by Day/Night

Figures 2.3.8 and 2.3.9 depict bicycle and pedestrian crashes by severity and day/night, respectively along the study area. 11 of the 12 crashes resulted in injuries. 25% of the bicycle and pedestrian crashes occurred at night.

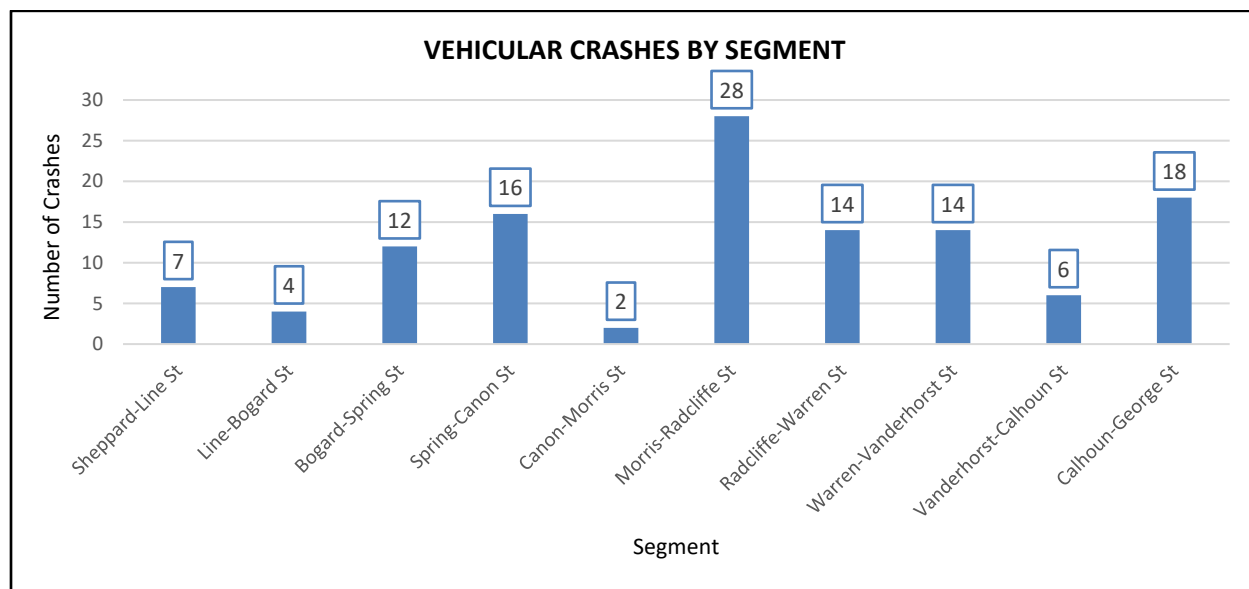


Figure 2.3.10- S-106 Vehicular Crashes by Segment

Figure 2.3.10 shows that the segment from Morris Street to Radcliffe Street had the highest number of crashes overall, followed by the segment from Calhoun Street to George Street.

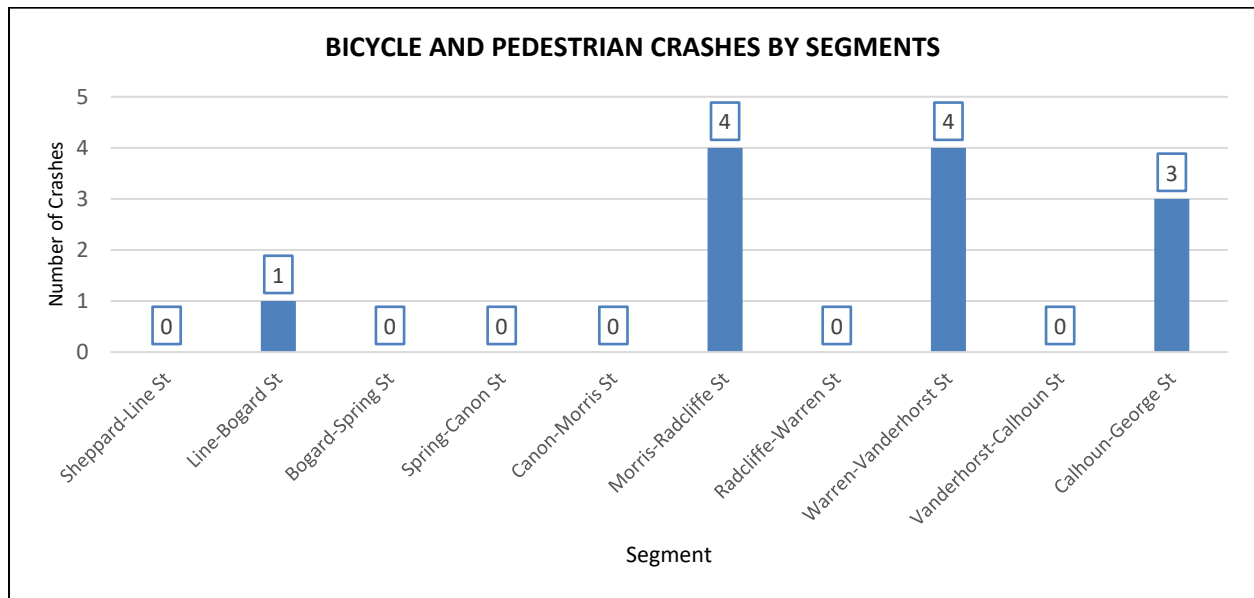


Figure 2.3.11- S-106 Bicycle and Pedestrians Crashes by Segment

As seen from Figure 2.3.11, the bicycle and pedestrian crashes are largely concentrated in three segments.

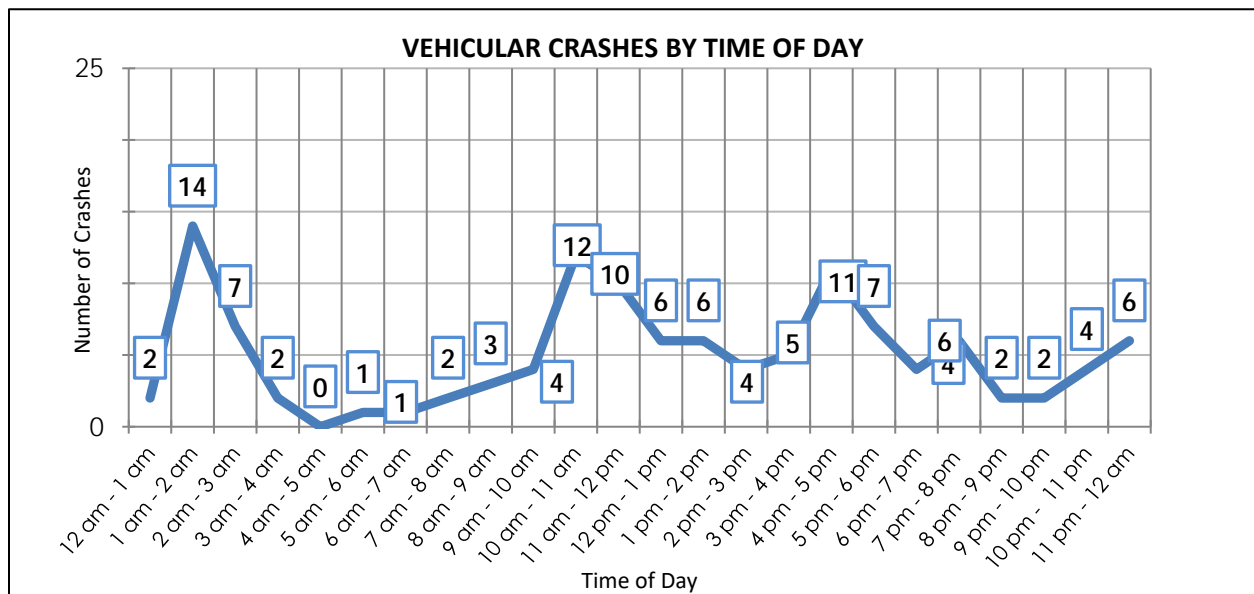


Figure 2.3.12 - S-106 Vehicular Crashes by Time of Day

As seen in Figure 2.3.12, majority of the crashes occur between 9:00 AM and 8:00 PM, but night-time crashes continue until 4:00 AM. Vehicular crashes spiked from 1:00 AM to 2:00 AM. These 14 crashes (between 1:00 AM to 2:00 AM) occurred throughout the corridor. Two of them were DUI crashes.

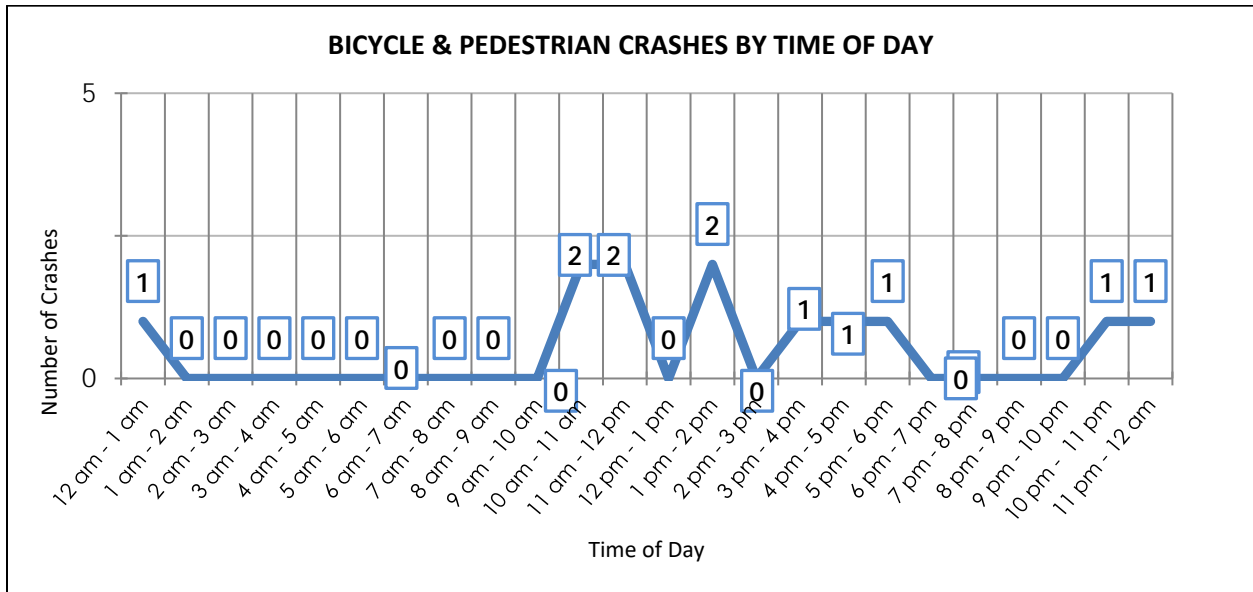


Figure 2.4.13- S-106 Bicycle & Pedestrian Crashes by Time of Day

Figure 2.3.13 shows that majority of the bicycle and pedestrian crashes occur from 10:00 AM to 1:00 AM.

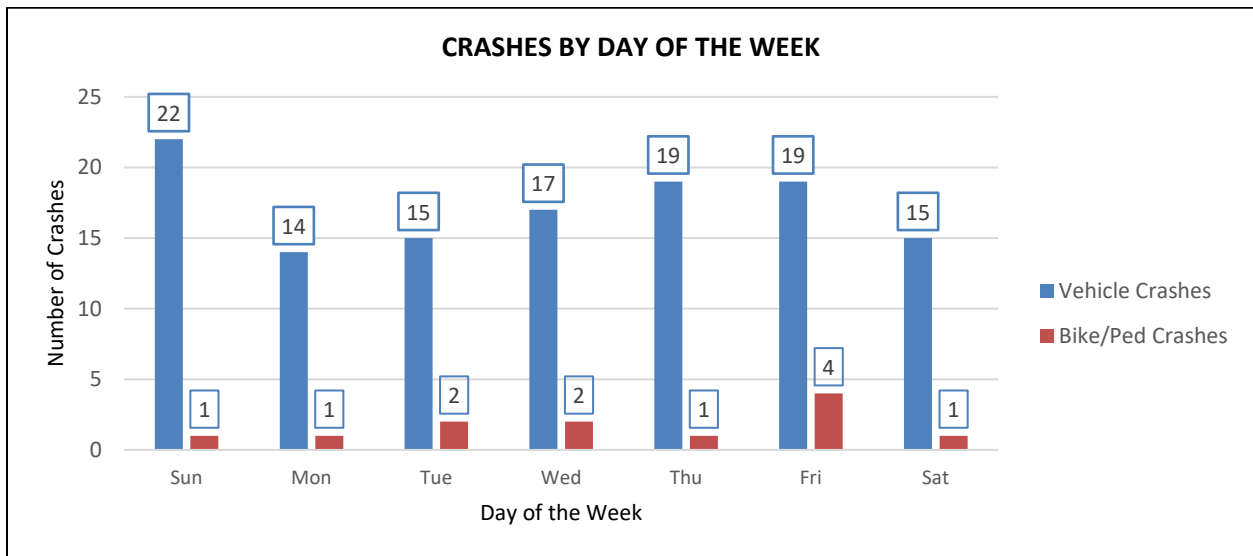


Figure 2.3.14 - S-106 Crashes by Day of the Week

As seen in Figure 2.3.14, crashes are generally spread throughout the week. Vehicular crashes are highest on Sundays.

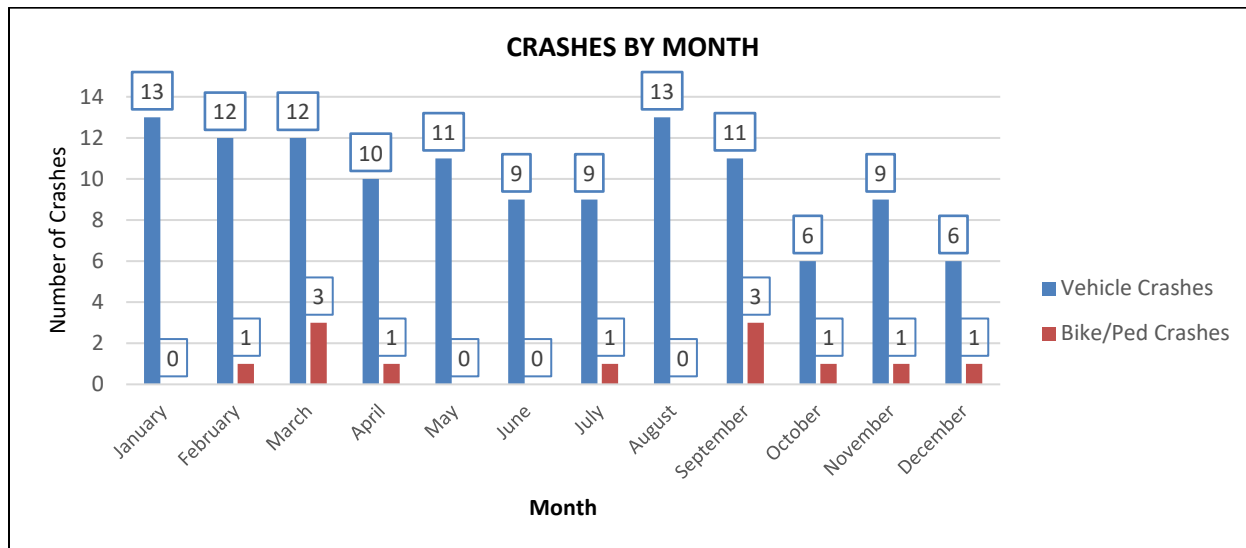


Figure 2.3.15 - S-106 Crashes by Month

Crashes by month are depicted in Figure 2.3.15. Crashes are highest from January to March.

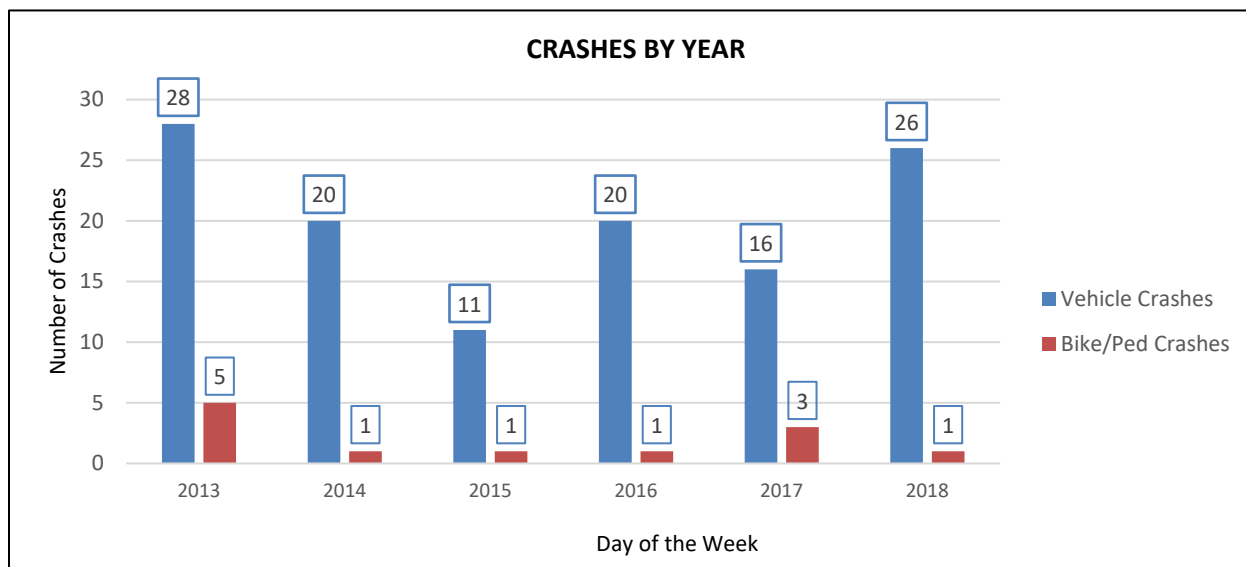


Figure 2.3.16 - S-106 Crashes by Year

Crashes by year are depicted in Figure 2.3.16.

2.4 SPEED STUDY

A speed study at 3 different locations along the corridor was conducted to gauge normal speed variations during non-rush hours. The posted speed limit is 25 mph along the entire study area.

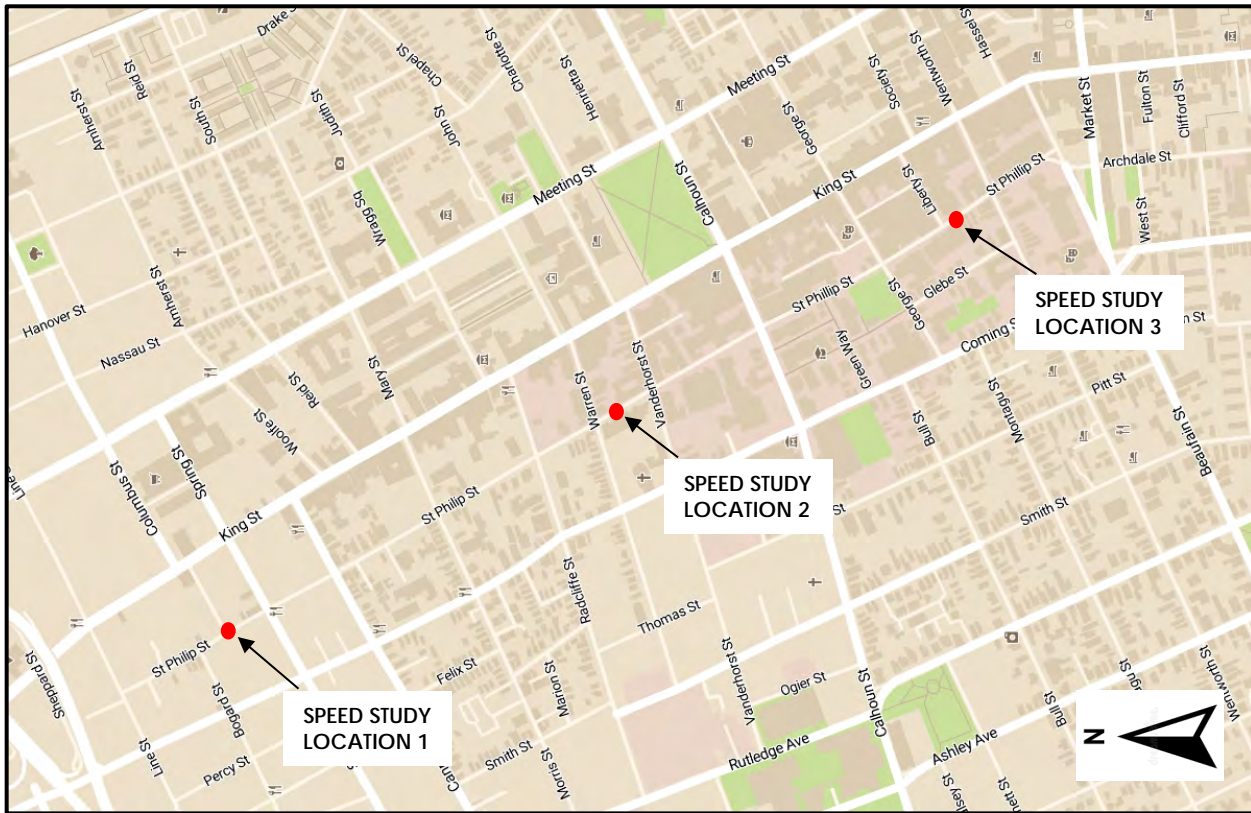


Figure 2.4.1- S-106 Speed Study Locations

Location	1	2	3
Time	11:50am to 12:05pm	12:10 to 12:25pm	12:25 to 12:40pm
Limit (mph)	25	25	25
Average (mph)	21	20	20
85th percentile (mph)	23	22	22

Table 2.1 – S-106 Speed Limits & Study Results

Results of the speed study show mid-day 85th percentile speeds are close to the posted speed limits. This aligns with Figures 2.3.5 to 2.3.7, which shows only 6% of vehicular crashes, 14% of bicycle crashes and 0% of pedestrian crashes were caused by “driving too fast for conditions”.

2.5 OTHER IMPROVEMENTS AND STUDIES

Holy Spokes

The Charleston bike share system, Holy Spokes, was launched in May 2017. There are four bike share stations within one block of Saint Philip Street. Hubs on or closest to Saint Philip Street include the ones at 558 King Street, 9 Radcliffe Street, 1883 Ann Street and College Way.

People Pedal Plan

The City's People Pedal Plan provides recommendations for bicycle and pedestrian improvements throughout the peninsula (Figure 2.5.1). For Saint Philip Street, it recommends adding Sharrows (Shared Lane Markings) as an interim solution between Line Street and Calhoun Street. Final recommendations call for making this street a 'bicycle boulevard' to provide cyclists a safe and direct route. This plan also calls for bike boxes at Radcliffe Street, John Street and George Street intersections, and cycle track treatment through the Calhoun Street intersection. The plan is shown in Appendix F.

Charleston Comprehensive Parking Study

Published in January 2019, the study provided a comprehensive analysis and set of recommendations for the city's parking system.

College of Charleston Bike Share Program

The College of Charleston (CofC) Bike Share was developed by a student-led team, with organizational and planning support from the Office of Sustainability. It's founded on the idea that bicycling can be a safe, healthy, sustainable, and fun way to get around the campus and Charleston. The program offers free bike rentals to any current students, faculty, and staff.

The CofC conducted a bicycle and pedestrian count study for the intersection of Saint Philip St./Calhoun St. in July 2018 and October 2018. For July 2018, peak hour counts showed the following:

- 10 am to 12 pm (weekday) – 74 bicyclists and 515 pedestrians
- 5 pm to 7 pm (weekday) – 56 bicyclists and 649 pedestrians
- 12 pm to 2 pm (Saturday) – 69 bicyclists and 828 pedestrians

For October 2018, peak hour counts showed the following:

- 10 am to 12 pm (weekday) – 192 bicyclists and 3522 pedestrians
- 5 pm to 7 pm (weekday) – 159 bicyclists and 2336 pedestrians
- 12 pm to 2 pm (Saturday) – 100 bicyclists and 1937 pedestrians

Charleston Moves Close Calls Database

Charleston Moves provided a copy of their incident reports for the RSA corridors. Two incidents were reported for S-106. One was a bicyclist reporting a car had passed by too closely. The other was a bicyclist reporting a van running a red light, causing a near miss.



Figure 2.5.1- People Pedal Plan

2.6 EXISTING ROADWAY SAFETY FEATURES

The following were identified as positive measures and features that are already in place within the study area that enhance road user safety:

- Continuous sidewalks: Sidewalks within the corridor are continuous and provide a generally comfortable walking environment.
- Vehicular speed along the corridor is largely controlled.
- Sight triangles: Intersection sight distance was not obstructed by signs or other obstacles for most of the intersection approaches.
- Crosswalks are present at most intersections, including ladder-style crosswalks in some intersections.
- Sidewalks at intersections have ramps.
- Existing bus stops were well marked and appear to be used.
- Saint Philip Street has adequate capacity and width for vehicular traffic.
- Most traffic signals have pedestrian signals.
- Acceptable traffic volumes for existing lane alignments.
- Portions of S-106 has lighting.

3.0 RECOMMENDATIONS

Recommendations for improving safety along S-106 are provided under two categories:

1. Improvements to be applied along the corridor
2. Intersection specific improvements

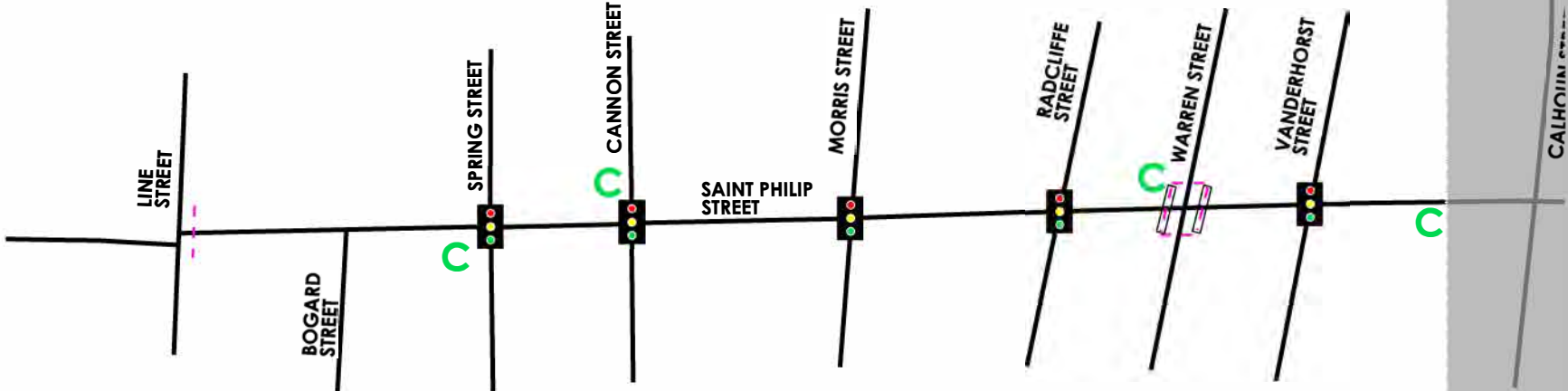
3.1 CORRIDOR IMPROVEMENTS

This section provides findings and recommendations for improvements to be applied along the S-106 corridor.





BICYCLE & PEDESTRIAN ACCOMMODATIONS

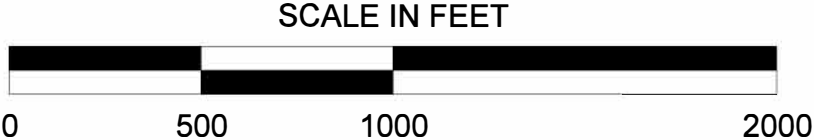
This study recognizes the need to provide safe pedestrian crossings that reflect pedestrian routing demand. Efforts are made to provide direct crossing routes as feasible. The exhibits on the following page show existing pedestrian crossings for S-106. The exhibits show each side street approach already has a stop-controlled crosswalk, with the exception of the Bogard Street and Rodgers Alley approaches. Those crosswalks are listed for improvements in this report. The exhibits also show generally good access for crossing S-106. Each of the 7 traffic signals have crosswalks across S-106, with crosswalks on both their northern and southern approaches. S-106 also has uncontrolled crosswalks at the Warren Street intersection, and between the Calhoun Street and George Street intersections. Average spacing between the S-106 crossings is 560 feet.

SAINT PHILIP STREET EXISTING PEDESTRIAN CROSSINGS



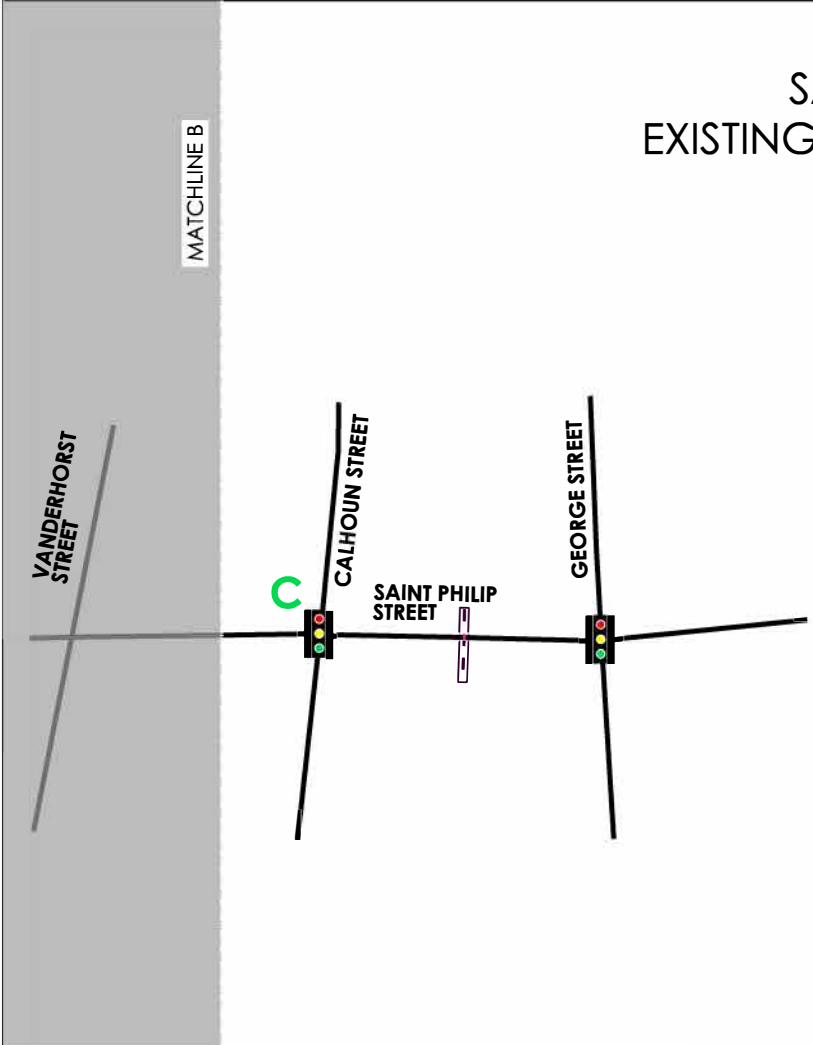
LEGEND

-  SIGNAL WITH CROSSWALKS
-  STOP-CONTROLLED CROSSWALK
-  UNCONTROLLED CROSSWALK
-  CARTA BUS STOP







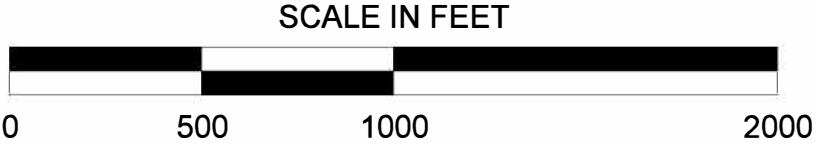
SHEET 1

SAINT PHILIP STREET EXISTING PEDESTRIAN CROSSINGS



LEGEND

-  SIGNAL WITH CROSSWALKS
-  STOP-CONTROLLED CROSSWALK
-  UNCONTROLLED CROSSWALK
-  CARTA BUS STOP



SHEET 2

A north arrow pointing towards the top right of the page.

BICYCLE & PEDESTRIAN ACCOMMODATIONS

FINDINGS:

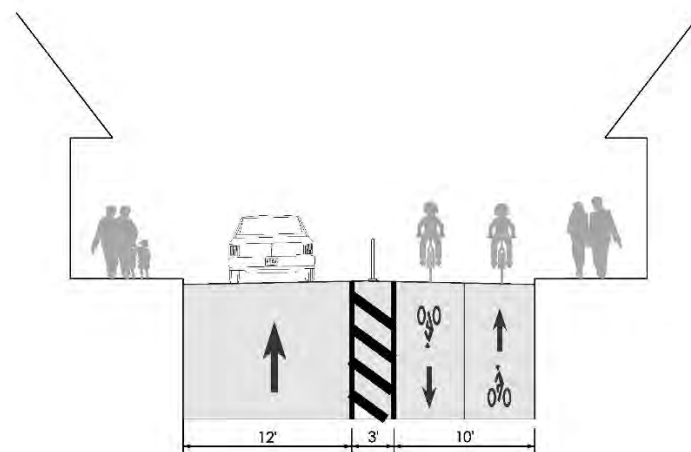
Bicyclists routinely use S-106, but it has no designated bicycle facilities. In the 6-year period from 2013-2018, 6 bicycle crashes occurred. These crashes were concentrated near the intersections with Cannon Street, Morris Street, Calhoun Street, and George Street.

IMPROVEMENTS:

Consider implementing bicycle improvements on S-106. The portion of S-106 south of Calhoun Street may be treated differently than the section north of it.

S-106 South of Calhoun Street

This section of S-106 is currently a one-way street with dual southbound lanes. Consider performing a traffic study to evaluate reducing S-106 to one travel lane with a dedicated two-way cycle track. A representative typical section is shown below:



These improvements could potentially be extended further south along S-106 under a separate project.

S-106 North of Calhoun Street

Consider converting S-106 into a bicycle boulevard, to improve bicycle safety and priority. The concept sketch on the following page shows a typical segment layout under this treatment. Shared use lane markings would be applied at regular intervals along S-106 to emphasize bicycle travel. S-106 approaches to each signalized intersection would have a double yellow centerline with turn lane markings where applicable. Midblock segments would have a single, dashed yellow centerline as shown. This centerline will make it easier for drivers to pass slower bicyclists, which could help with some of the report driver aggression. White travel lane markings will help enhance the other traffic calming elements of the street.

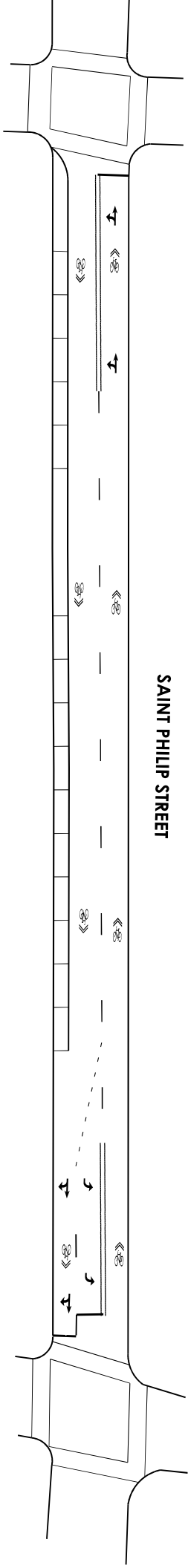
Typical bicycle crash reduction of 63% for installation of a bicycle boulevard.

MORRIS STREET



SAINT PHILIP STREET

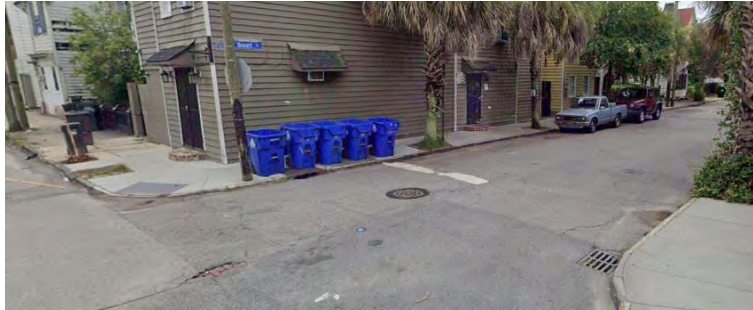
RADCLIFFE STREET



BICYCLE & PEDESTRIAN ACCOMMODATIONS

FINDINGS:

Crosswalks are missing across two of the stop-controlled side streets approaches, Bogard Street and Rodgers Alley.



Missing crosswalk at Bogard St.

IMPROVEMENTS:

Consider adding ladder-style crosswalks to these side street approaches.

Typical pedestrian crash reduction of 50% for installation of crosswalks

FINDINGS:

Existing crosswalks at some side street approaches are not ladder-style



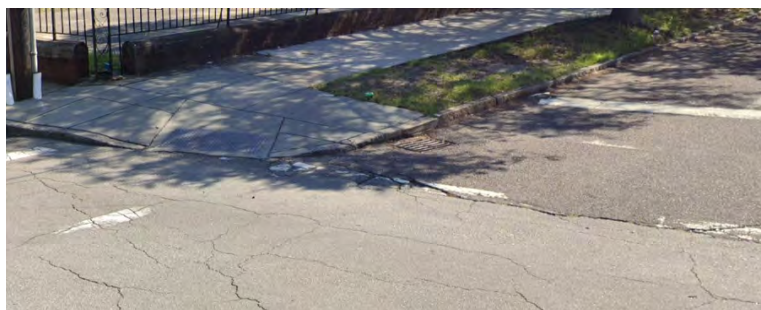
Existing crosswalk at Morris St.

IMPROVEMENTS:

Consider upgrading existing crosswalks at side street approaches to be ladder-style. (Approximately 9 approaches)

FINDINGS:

Some ADA ramps do not align with crosswalks across several approaches.



A ramp at the Radcliffe St. intersection not aligning with the crosswalk

IMPROVEMENTS:

Consider reconstructing ADA ramps or relocate crosswalks that don't align, where feasible (approximately 8 locations)

BICYCLE & PEDESTRIAN ACCOMMODATIONS

FINDINGS:

Detectable warning surfaces are missing at several locations throughout the corridor.



Sidewalk without detectable warning surface at Calhoun St.

IMPROVEMENTS:

Consider adding detectable warning surfaces on ADA ramps at the signalized intersections and unsignalized side street crossings. (Approximately 5 ramps)

FINDINGS:

Pedestrians crossing the signalized intersections are dependent on right turning vehicles yielding to them.

IMPROVEMENTS:

To enhance pedestrian safety, consider implementing Leading Pedestrian Intervals (LPIs) for the signalized pedestrian crossings. LPIs give pedestrians the opportunity to enter a signalized intersection 4–7 seconds before vehicles are given green indications. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles begin entering the intersection. A traffic analysis study is needed to verify LPIs will not materially affect congestion and delays.

None of the signalized intersections along S-106 currently have pedestrian pushbuttons. Incorporation of LPI would typically include them to avoid unnecessary traffic delays.

Typical pedestrian crash reduction of 59% for installation of LPIs.

FINDINGS:

Pedestrian activity is high at the Calhoun Street intersection.



Heavy pedestrian activity at Calhoun Street intersection

IMPROVEMENTS:

To enhance pedestrian safety, consider adding an all pedestrian signal phase at the Calhoun Street intersection. A more comprehensive evaluation of signal timing plans would be needed prior to implementation. S-106 traffic signals are part of the overall downtown signal system.

PAVEMENT MARKINGS AND SIGNING

FINDINGS:

Pavement marking and RPM markings in several sections are worn out.



Existing pavement markings worn out

IMPROVEMENTS:

Consider upgrading pavement markings and RPM throughout the corridor.

Typical crash reduction of 5% for installation of RPMs.

MAINTENANCE

FINDINGS:

Sections of the sidewalks and ADA ramps are damaged and/or uneven. The sidewalks are also obstructed with utility poles, tree planting boxes, etc. This creates challenges for pedestrians with mobility restrictions. During the audit, a pedestrian in a motorized chair was observed traveling in the parking lane. Additionally, some sidewalks vary in width and some segments are not ADA compliant.



Sidewalk at Line St. approach needs to be repaired.

IMPROVEMENTS:

Perform sidewalk and ramp reconstruction repairs to improve access and mobility. Clean debris from sidewalk.

MAINTENANCE

FINDINGS:

Tree limbs along the corridor block visibility of drivers and obstruct view of traffic signs and signals. Also, vegetation has overgrown on sidewalks in some sections.

IMPROVEMENTS:

Consider pruning trees and vegetation for better visibility and access.

DRAINAGE

FINDINGS:

Storm drain inlets are in the roadway, some of which do not accommodate bicycle tires. This requires bicyclists to maneuver around them.



Existing storm drain inlets on the travel lane.

IMPROVEMENTS:

Consider replacing these grates with bicycle friendly grates. (Approximately 15 grates)

STREET LIGHTING

FINDINGS:

39% of vehicular and 25% of bicycle/pedestrian crashes occurred at night. Roadway lighting along S-106 could help reduce night time crashes. The section from Vanderhorst Street to Cannon Street has been particularly noted.

IMPROVEMENTS:

Consider adding and upgrading street lighting along the corridor. SCDOT requires illumination uniformity along a given roadway. This is needed to avoid blind spots and safety issues being created. It is particularly important for older drivers. The same street trees that provide canopy shade and enhance aesthetics make street illumination difficult. Both high-level and low-level street lighting could be required. Construction costs can be determined through a lighting study.

Typical crash reduction of 20% for night time crashes with installation of street lighting.

TRAFFIC SIGNALS AND SIGNING

FINDINGS:

All the signalized intersections lack retroreflective backplates: Spring St., Cannon St., Morris St., Radcliffe St., Vanderhorst St., Calhoun St., and George St.



Existing Vanderhorst St. signal heads without retroreflective backplates.

IMPROVEMENTS:

Consider installing retroreflective backplates to improve signal head visibility.

Typical total crash reduction of 15%.

FINDINGS:

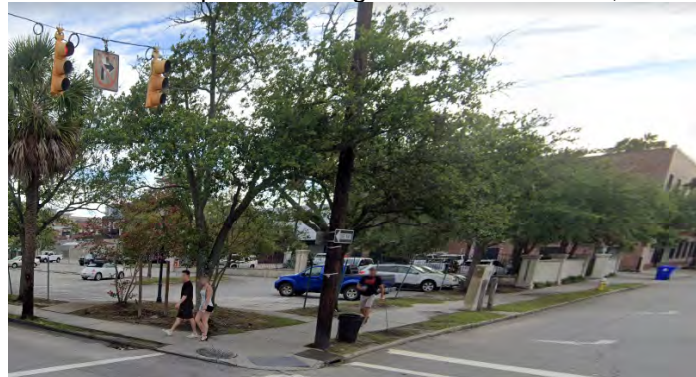
All of the signalized intersection approaches appear to have 8" signal heads, which are no longer MUTCD compliant:

IMPROVEMENTS:

Evaluate the viability of replacing each approach with 12" signal heads as per MUTCD requirements. Data on utility attachment heights and vertical clearances will be needed, as well as coordination with Dominion Energy and telecom providers.

FINDINGS:

The following intersections do not have pedestrian signal heads: Morris St., and Radcliffe St.



Morris St. intersection without pedestrian signal heads, countdowns and pushbuttons

IMPROVEMENTS:

Consider installing countdown pedestrian signal heads at these intersections to encourage safe crossing along S-106.

Typical bicycle and pedestrian crash reduction of 70% for installation of pedestrian signal heads.

EDUCATION AND OUTREACH

FINDINGS:

Cyclists have been observed to disobey traffic rules, particularly by running red lights. Pedestrians are routinely observed to cross at undesignated location. The crash data also suggests motorists are failing to yield proper right of way to bicyclists and pedestrians. Behavioral improvements of all users could improve safety.

IMPROVEMENTS:

Education and outreach programs for bicycles and pedestrians are designed to alert roadway users on the importance of safe travel practices, educate them on safe practices, and encourage active transportation modes for a healthy lifestyle. Typically, these programs are local initiatives, led by a combination of local governments, schools, and community groups. Various municipalities across the US have developed and implemented their own education and outreach programs. Among the typical elements that may be appropriate for this corridor area include:

- Public Awareness Campaigns – Intermittent educational / advertising programs that notify the public on the program’s initiatives and importance. They can be delivered through local media such as radio, television, billboards, and transit vehicle ads, as well as non-media methods such as classroom programs and partnering with community events. Targeting specific age and ethnic groups has demonstrated effective results for some programs. Targeted campaigns have helped pedestrians understand how to interpret traffic signals, how to be more visible at night, how to be more aware of turning vehicles at intersections, and how to travel defensively through techniques like making eye contact with a driver. For drivers, these campaigns often focus on yielding to pedestrians and expanding awareness of bicycling and crosswalk laws.
- Public Service Announcements (PSAs) – Social media, radio, and/or television are used to promote safe cycling, walking, and driving behaviors.
- Promotional Items – Tote bags, T-shirts, magnets, coffee cup sleeves, or other items with printed logos and content can be distributed to the public.
- Partnerships – Government organizations, schools, non-profits, universities, businesses groups, and community groups combine efforts to interact with the public.
- Community Events – Safety education can be included at public events like festivals, school events, and health fairs.
- Skills Practice – Lectures, videos, and/or on-street simulations for college students, school children, and older adults.
- How-To Guides – Printed brochures or internet content.
- Budgeting – Many program components require funding. Social media and volunteer efforts can be very cost effective.

ENFORCEMENT

FINDING:

Crash data involving bicyclists and pedestrians show that most crashes were caused by some form of improper maneuver by drivers, pedestrians, or bicyclists (Failed to Yield Right of Way, Disregard Signs and Signals, Aggressive operation of vehicle, or distracted). Each of these above can potentially be mitigated with targeted enforcement.

IMPROVEMENTS:

While design improvements can provide safer infrastructure, enforcement is still beneficial to change these behaviors. Increased enforcement can play a critical role in the reduction of crashes along the corridor. Proactive steps will be needed to ensure enforcement does not disproportionately affect minority and low-income communities.

3.2 INTERSECTION SPECIFIC IMPROVEMENTS

The following sections contain findings and recommendations for improvements at individual intersections.

S-106 and Line Street

Findings:

- ADA ramp in the southeastern corner is missing a detectable warning surface.

Improvements:

- Install detectable warning surface on the existing ADA ramp.

S-106 and Bogard Street

Findings:

- There is no crosswalk present at the side street approach.
- The crosswalk along this intersection could be shortened to reduce pedestrian exposure time.

Improvements:

- Add a ladder-style crosswalk at this approach.
- Consider constructing curb extensions in the northwest and southwest corners and along the eastern side of S-106 to accommodate crosswalks on Bogard Street and the northern approach of Saint Philip Street. The recommended crosswalk across the northern approach of S-106 may be a raised crosswalk (pending future evaluation as per SCDOT traffic calming guidelines). The bicycle parking coral would be shifted to the north. The fire hydrant may require relocating.

S-106 and Rodgers Alley

Findings:

- There is no crosswalk present at the side street approach.
- There are no detectable warning surfaces present.
- The pavement across this approach appear to be damaged.

Improvements:

- Rodgers Alley will be closed as part of the Courier Square development, so a Rodgers Alley crosswalk may not be warranted. This will also negate the need for detectable warning surface or Rodgers Alley pavement upgrades.

S-106 and Spring Street

Findings:

- The crosswalks could be shortened to reduce pedestrian exposure time while crossing.
- The ramp at the southwest corner of the intersection does not align with the existing crosswalk.

Improvements:

- Consider constructing curb extensions at each of the four intersection corners to reduce crosswalk lengths. Each curb extension should be designed to account for truck turning movements, drainage, and utilities. In order to reduce crosswalk lengths, some crosswalks will need to be relocated away from the intersection. ADA ramps will need to be reconstructed accordingly.

S-106 and Cannon Street

Findings:

- The crosswalks could be shortened to reduce pedestrian exposure time while crossing.

Improvements:

- Consider constructing curb extensions at the northeast, northwest, and southwest intersection corners to shorten the northern and southern crosswalks. ADA ramps will need to be reconstructed accordingly.

S-106 and Morris Street

Findings:

- The ramp at the northwest corner of the intersection does not align with the existing crosswalk.
- The crosswalks could be shortened to reduce pedestrian exposure time while crossing.

Improvements:

- Consider constructing curb extensions at the northeast, northwest, and southeast intersection corners to shorten the northern, western, and southern crosswalks. ADA ramps will need to be reconstructed accordingly.

S-106 and Radcliffe Street

Findings:

- The ADA ramp at the southwest corner of the intersection does not align with the crosswalk.
- The sidewalk at the southeast corner needs vegetation and sediment removed.
- Traffic signal cabinet and utility pole restrict the sidewalk in the southwest corner of the intersection.



Improvements:

- Consider reconstructing the ramp or relocating the crosswalk at the southwest corner, to make them align, where feasible.
- Clean the sidewalk at the southeast corner.
- Evaluate options for relocating signal cabinet and utility pole to increase effective sidewalk width.

S-106 and Warren Street

Findings:

- The ADA ramps at the northeast, northwest, and southwest corners of the intersection do not align with the crosswalks.
- The free flow S-106 crosswalks do not offer as much pedestrian protection as the other intersections along this segment, which are signalized.

Improvements:

- Consider reconstructing the ramps or relocating the crosswalks at the northeast, northwest, and southwest corners, to make them align, where feasible.
- Consider removing the overhead flasher and converting this to a raised intersection as a traffic calming strategy (pending future evaluation as per SCODT traffic calming guidelines).

S-106 and Vanderhorst Street

Findings:

- Students and faculty cross S-106 to and from the parking garage midway between Vanderhorst Street and Calhoun Street. Spacing between the Vanderhorst Street and Calhoun Street signalized crosswalks is 590 feet.

Improvements:

- Consider installing a high visibility midblock crosswalk with W11-2 and W16-7P signage. Omit parking to include a curb extension on the western side, reducing the crossing distance. A further evaluation of pedestrian behavior and movement is needed when college session resumes in full, which can be further determined as part of the actual project.

S-106 and Calhoun Street

Findings:

- There is no detectable warning surface at the southeast corner of the intersection.
- The ADA ramp at the southwest corner of the intersection do not align with the crosswalk at the western approach.
- There is a lot of pedestrian activity (especially students) at this intersection.

Improvements:

- Add a detectable warning surface at the southeast corner.
- Consider reconstructing the ramp at the southwest corner or relocating the crosswalk at the western approach, to make them align, where feasible.
- To enhance pedestrian safety, consider implementing pedestrian scramble phases at this intersection. A more comprehensive evaluation of signal timing plans may be required before implementation.
- Consider creating more pedestrian space on all adjacent private parcels, and explore opportunities to reduce/remove landscape, knee walls, etc. to allow hardscape space for pedestrian queuing.

S-106 and Green Way

Findings:

- The midblock crosswalk has beacons that flash constantly, causing drivers to not notice when pedestrians are crossing.

Improvements:

- Consider replacing the flashing beacons with pedestrian activated RRFBs.
- Consider upgrading to a raised crosswalk (pending approval under SCDOT traffic calming guidelines)

S-106 and George Street

Findings:

- The detectable warning surface at the northeast corner of the intersection is damaged.

Improvements:

- Repair the damaged detectable warning surface.

4.0 SUMMARY OF CONSTRUCTION COSTS

Probable construction costs for the recommended improvements are provided below. Note these costs do not include preliminary engineering, right of way, utility relocation or CE&I costs.

CORRIDOR RECOMMENDATIONS (SECTION 3.1)	
IMPROVEMENT	COST
South of Calhoun Street- Consider reducing S-106 to one travel lane with a dedicated cycle track.	\$90,000
North of Calhoun Street- Consider converting to bicycle boulevard.	\$55,000
Add crosswalks to side street approaches. (Approx. 2 approaches)	\$1,500
Upgrade side street crosswalks to ladder style. (Approx. 9 approaches)	\$6,500
Add detectable warning surfaces to ADA ramps at signalized and unsignalized side street crossings. (Approx. 5 ramps)	\$2,000
Consider implementing Leading Pedestrian Intervals (LPIs), and adding pedestrian pushbuttons (Approx. 7 signals)	\$77,000
Upgrade pavement markings and raised pavement markers.	N/A
Maintenance- Clean sidewalks and ramps with debris, trim overgrown vegetation and trees.	N/A
Maintenance- Perform sidewalk and ramp reconstruction repairs.	\$50,000
Replace existing drop inlet grates to bicycle friendly grates. (Approx. 15 grates)	\$8,000
Consider installing uniform street lighting.	TBD
Install retroreflective backplates to improve signal head visibility. Note: Utility pole availability must be coordinated with Dominion Energy. (Approx. 7 intersections)	\$12,000
Replace 8" signal heads with 12" signal heads, as per MUTCD. Note: Utility pole availability must be coordinated with Dominion Energy. (Approx. 7 intersections)	\$128,000
Install countdown pedestrian signal heads and pushbuttons to improve pedestrian safety. (Approx. 2 intersections)	\$35,000
Subtotal	\$465,000
Contingency (30%)	\$139,500
INTERSECTION SPECIFIC IMPROVEMENTS (SECTION 3.2)	
IMPROVEMENT	COST
Line St. – Improvements included in section 3.1.	N/A
Bogard St. – Consider constructing curb extensions at the northwest and southwest corners, and a potential raised crosswalk across the northern approach of S-106 (other improvements included in section 3.1).	\$46,000
Rodgers Alley – Improvements included in section 3.1.	N/A
Spring St. – Consider constructing curb extensions at each of the four corners.	\$90,000
Cannon St. – Consider constructing curb extensions at three corners (other improvements included in section 3.1).	\$58,000
Morris St. - Consider constructing curb extensions at three corners. (other improvements included in section 3.1).	\$58,000
Radcliffe St. – Reconstruct ramps to align with crosswalk or relocate crosswalk at the southwest corner. Evaluate relocating the signal cabinet and utility pole (other improvements included in section 3.1).	\$60,000
Warren St. – Reconstruct ramps to align with crosswalks or relocate crosswalks at the southwest, northwest and northeast corners. Consider converting this to a raised intersection. (other improvements included in section 3.1).	\$130,000

Vanderhorst St. - Consider installing a high visibility midblock crosswalk with W11-2 and W16-7P signs, between Vanderhorst St. and Calhoun St. Include curb extension.	\$30,000
Calhoun St. – Reconstruct ramps to align with crosswalk or relocate crosswalk at the southwest corner. Implement a pedestrian scramble phase at this intersection. Create more pedestrian space on all adjacent private parcels (other improvements included in section 3.1).	\$60,000
Green Way – Consider replacing replacing flashing beacons with RRFBs. Consider raising the midblock crosswalk.	\$45,000
George St. – Repair damaged detectable warning surface at the northeast corner (other improvements included in section 3.1).	\$1,000
INTERSECTION SPECIFIC IMPROVEMENTS (SECTION 3.2)	
Subtotal	\$578,000
Contingency (30%)	\$173,400
Total (Sections 3.1-3.2)	\$1,355,900

*Note: The cost for upgrading pavement markings is included in the cost of other items.

Right of way acquisition costs for pedestrian space are excluded from the construction costs.

5.0 PRIORITIZATION

Appendix E shows the annualized cost and benefit for each improvement, as applicable. Costs are based on conceptual construction costs only. Costs are annualized based on the following life cycle of improvements:

- Thermoplastic pavement markings – 5 years
- Roadway signs – 10 years
- Other items – 20 years

Benefits are based on the estimated savings from potential crash reductions. The predictions for crash reductions used in the analysis are based on national research of engineering studies that used crash data to quantify the safety effect of the corresponding countermeasure. Application of the crash modification factors to this particular corridor is somewhat subjective, so the computed benefits should only be considered as generally applicable. This report also recognizes some improvements have intangible benefits beyond crash reductions. For example, improvements to bicycle and pedestrian facilities can provide a level of comfort for its users. They can also lead to increased usage, providing public convenience, health, and/or economic benefits from the improved transportation system.

In this section, each suggested improvement is evaluated based on its cost, ease of construction, impacts, benefit-cost (B/C) ratio, and how it relates to other improvements. Based on these evaluations, improvements are grouped into potential short term and long-term categories. These categories are for planning purposes only and can be subject to change based on funding and other factors. The B/C ratios are calculated for each improvement individually. So, cumulative benefits from performing all the recommended improvements may be less than what is shown.

SHORT TERM		
IMPROVEMENT	COST	B/C
Add crosswalks to side street approaches. (Approx. 2 approaches)	\$1,500	<1
Upgrade side street crosswalks to ladder style. (Approx. 9 approaches)	\$6,500	<1
Add detectable warning surfaces to ADA ramps at signalized and unsignalized side street crossings. (Approx. 5 ramps)	\$2,000	N/A
Consider implementing Leading Pedestrian Intervals (LPIs), and adding pedestrian pushbuttons (Approx. 7 signals)	\$77,000	7.72
Upgrade pavement markings and raised pavement markers.	N/A	N/A
Maintenance- Clean sidewalks and ramps with debris, trim overgrown vegetation and trees.	N/A	N/A
Maintenance- Perform sidewalk and ramp reconstruction repairs.	\$50,000	
Replace existing drop inlet grates to bicycle friendly grates. (Approx. 15 grates)	\$8,000	N/A
Install retroreflective backplates to improve signal head visibility. Note: Utility pole availability must be coordinated with Dominion Energy. (Approx. 7 intersections)	\$12,000	38.99
Replace 8" signal heads with 12" signal heads, as per MUTCD. Note: Utility pole availability must be coordinated with Dominion Energy. (Approx. 7 intersections)	\$128,000	4.64

Install countdown pedestrian signal heads and countdowns to improve pedestrian safety. (Approx. 2 intersections)	\$35,000	8.53
Line St. – Improvements included in section 3.1.	N/A	N/A
Bogard St. – Consider constructing curb extensions at the northwest and southwest corners, and a potential raised crosswalk across the northern approach of S-106 (other improvements included in section 3.1).	\$46,000	N/A
Rodgers Alley – Improvements included in section 3.1.	N/A	N/A
Spring St. – Consider constructing curb extensions at each of the four corners.	\$90,000	N/A
Cannon St. – Consider constructing curb extensions at three corners (other improvements included in section 3.1).	\$58,000	2.84
Morris St. - Consider constructing curb extensions at three corners. (other improvements included in section 3.1).	\$58,000	N/A
Radcliffe St. – Reconstruct ramps to align with crosswalk or relocate crosswalk at the southwest corner. Evaluate relocating the signal cabinet and utility pole (other improvements included in section 3.1).	\$60,000	N/A
Warren St. – Reconstruct ramps to align with crosswalks or relocate crosswalks at the southwest, northwest and northeast corners. Consider converting this to a raised intersection. (other improvements included in section 3.1).	\$130,000	<1
Vanderhorst St. - Consider installing a high visibility midblock crosswalk with W11-2 and W16-7P signs, between Vanderhorst St. and Calhoun St. Include curb extension.	\$30,000	2.51
Calhoun St. – Reconstruct ramps to align with crosswalk or relocate crosswalk at the southwest corner. Implement a pedestrian scramble phase at this intersection. Create more pedestrian space on all adjacent private parcels (other improvements included in section 3.1).	\$60,000	5.08
Green Way – Consider replacing flashing beacons with RRFBs. Consider raising the midblock crosswalk.	\$45,000	<1
George St. – Repair damaged detectable warning surface at the northeast corner (other improvements included in section 3.1).	\$1,000	N/A
Subtotal	\$898,000	
Contingency (30%)	\$269,400	
Total	\$1,167,400	

LONG TERM		
IMPROVEMENT	COST	B/C
South of Calhoun Street- Consider reducing S-106 to one travel lane with a dedicated cycle track.	\$90,000	6.90
North of Calhoun Street- Consider converting to bicycle boulevard.	\$55,000	9.93
Consider installing uniform street lighting.	TBD	N/A
Subtotal	\$145,000	
Contingency (30%)	\$43,500	
Total	\$188,500	

*Note: Costs for this recommendation will vary based on the alternate selected. Right of way acquisition costs for pedestrian space are excluded from the construction costs.

Appendix A CRASH TYPES AND YEARLY TRENDS

**TABLE A
SAINT PHILIP ST CRASH SUMMARY
CRASH TYPES AND YEARLY TRENDS**

Block	Crashes in Section	# of Injury Crashes	# of Fatal Crashes	# of Rear End Crashes	# of Angle Crashes	# of Sideswipe Crashes	# of No Collision W/Motor Vehicle	# of Wet Road Crashes	# of Dry Road Crashes	# of Bicycle Crashes	# of Pedestrian Crashes	# of DUI Crashes	# of Distracted Crashes	# of Day Crashes	# of Night Crashes	# of Crashes in 2013	# of Crashes in 2014	# of Crashes in 2015	# of Crashes in 2016	# of Crashes in 2017	# of Crashes in 2018
SHEPPARD - LINE ST	7	1	0	0	3	2	0	1	6	0	0	0	2	4	3	2	1	0	2	0	2
LINE - BOGARD ST	4	1	0	0	1	1	0	0	4	1	0	0	0	3	1	3	1	0	0	0	0
BOGARD - SPRING ST	12	2	0	1	3	7	1	3	9	0	0	0	4	7	5	1	5	1	3	2	0
SPRING - CANON ST	18	3	0	3	4	7	1	2	16	0	0	0	4	8	10	5	1	1	3	3	5
CANON - MORRIS ST	4	0	0	0	1	1	0	1	3	0	0	0	1	2	2	1	0	1	0	0	2
MORRIS - RADCLIFFE ST	29	9	0	2	14	4	4	3	26	3	1	2	7	19	10	8	6	0	4	6	5
RADCLIFFE - WARREN ST	14	4	0	0	9	1	2	1	13	0	0	1	1	9	5	6	1	3	2	1	1
WARREN - VANDERHORST ST	14	5	0	0	7	2	3	3	10	1	3	0	5	12	2	3	2	1	3	1	4
VANDERHORST - CALHOUN ST	9	1	0	1	1	5	1	4	5	0	0	0	2	2	7	2	2	1	0	0	4
CALHOUN - GEORGE ST	22	7	0	4	3	7	6	4	18	1	2	1	7	14	8	2	2	4	4	6	4
Grand Total	133	33	0	11	46	37	18	22	110	6	6	4	33	80	53	33	21	12	21	19	27
% of Total		24.81%	0.00%	8.27%	34.59%	27.82%	13.53%	16.54%	82.71%	4.51%	4.51%	3.01%	24.81%	60.15%	39.85%	24.81%	15.79%	9.02%	15.79%	14.29%	20.30%

TABLE A.1
 SAINT PHILIP ST CRASH SUMMARY
 CRASH TYPES AND YEARLY TRENDS

SHEET #	SEGMENT	CRASHES	ANGLE	SIDESWIPE	REAR-END	OTHER	BIKE	PED	WET	DRY	INJURY	FATAL	PDO
1	SHEPPARD - LINE ST	7	3	2	0	2	0	0	1	6	1	0	6
	LINE - BOGARD ST	4	1	1	0	2	1	0	0	4	1	0	3
2	BOGARD - SPRING ST	12	3	7	1	1	0	0	3	9	2	0	10
	SPRING - CANON ST	18	4	7	3	4	0	0	2	16	3	0	15
3	CANON - MORRIS ST	4	1	1	0	2	0	0	1	3	0	0	4
4	MORRIS - RADCLIFFE ST	29	14	4	2	9	3	1	3	26	9	0	20
5	RADCLIFFE - WARREN ST	14	9	1	0	4	0	0	1	13	4	0	10
	WARREN - VANDERHORST ST	14	7	2	0	5	1	3	3	10	5	0	9
6	VANDERHORST - CALHOUN ST	9	1	5	1	2	0	0	4	5	1	0	8
7	CALHOUN - GEORGE ST	22	3	7	4	8	1	2	4	18	7	0	15
	TOTAL	133	46	37	11	39	6	6	22	110	33	0	100

**TABLE B
SAINT PHILIP ST CRASH SUMMARY
MONTHLY AND DAILY TRENDS**

Block	Crashes in Section	# of Crashes												# of Crashes						
		in Jan	in Feb	in Mar	in Apr	in May	in Jun	in Jul	in Aug	in Sep	in Oct	in Nov	in Dec		on Sun	on Mon	on Tue	on Wed	on Thu	on Fri
SHEPPARD - LINE ST	7	0	1	0	1	1	1	1	0	0	0	1	0	0	1	0	1	1	2	1
LINE - BOGARD ST	4	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1
BOGARD - SPRING ST	12	0	0	2	1	1	0	2	0	2	1	2	2	3	0	3	3	1	0	2
SPRING - CANON ST	18	1	4	3	3	0	1	1	3	1	1	0	0	8	3	2	0	1	2	2
CANON - MORRIS ST	4	1	0	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0
MORRIS - RADCLIFFE ST	29	4	1	1	0	2	3	3	3	6	4	2	1	5	4	5	3	4	5	3
RADCLIFFE - WARREN ST	14	3	1	2	0	2	1	2	0	1	1	0	1	1	2	1	1	3	2	4
WARREN - VANDERHORST ST	14	2	2	2	3	0	1	0	0	2	0	2	0	1	2	4	2	2	2	1
VANDERHORST - CALHOUN ST	9	1	0	1	1	3	1	0	0	0	0	1	0	1	0	0	3	2	3	0
CALHOUN - GEORGE ST	22	1	3	3	0	1	1	1	3	4	0	3	2	2	2	1	6	4	5	2
Grand Total	133	13	13	15	10	11	9	10	13	14	8	10	7	23	15	17	19	20	23	16
% of Total		9.77%	9.77%	11.28%	7.52%	8.27%	6.77%	7.52%	9.77%	10.53%	6.02%	7.52%	5.26%	17.29%	11.28%	12.78%	14.29%	15.04%	17.29%	12.03%

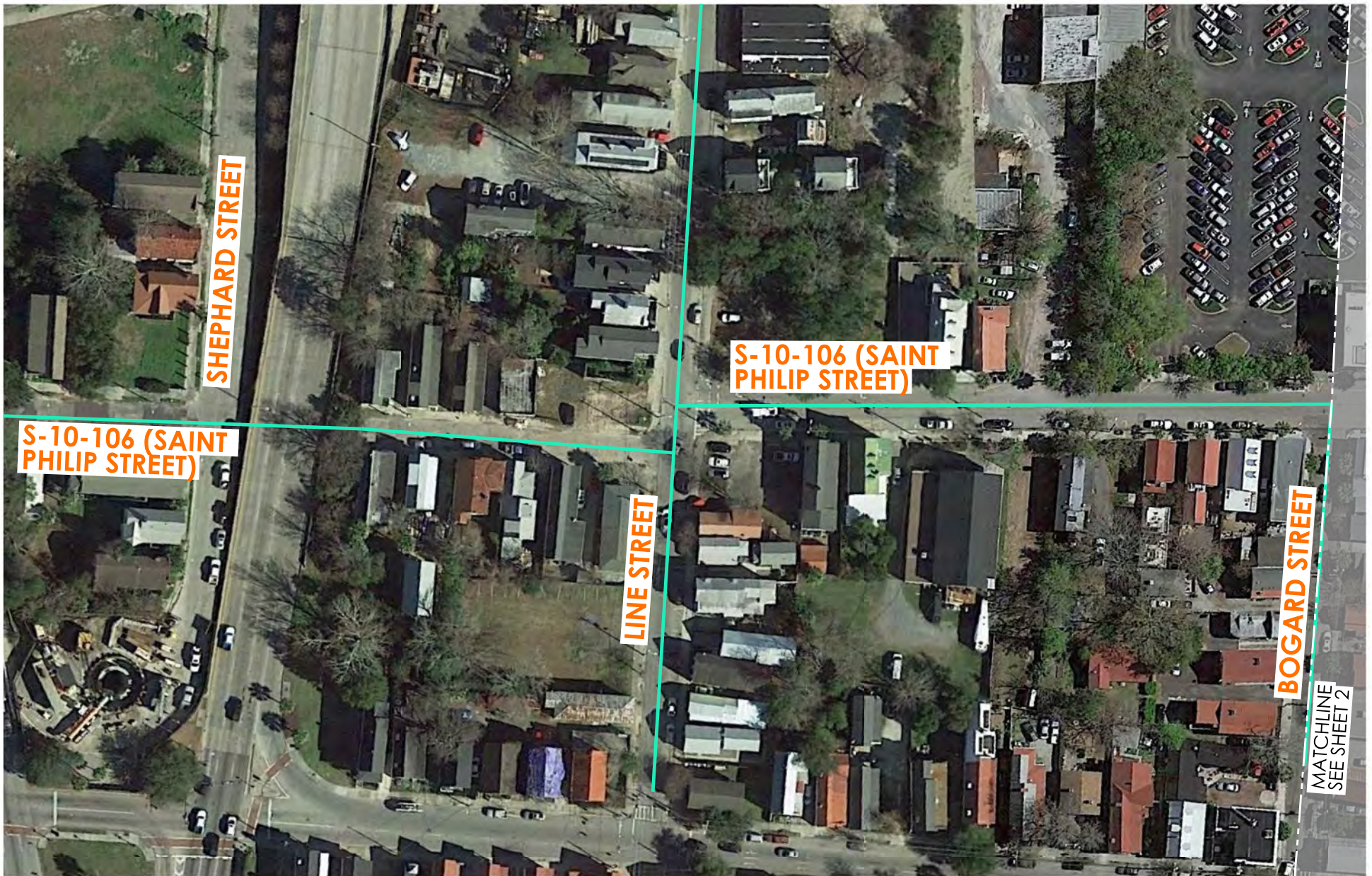
**TABLE C
SAINT PHILIP ST CRASH SUMMARY
HOURLY TRENDS**

Block	Crashes in Section	# Crashes 12am-1am	# Crashes 1am-2am	# Crashes 2am-3am	# Crashes 3am-4am	# Crashes 4am-5am	# Crashes 5am-6am	# Crashes 6am-7am	# Crashes 7am-8am	# Crashes 8am-9am	# Crashes 9am-10am	# Crashes 10am-11am	# Crashes 11am-12pm
SHEPPARD - LINE ST	7	1	1	0	0	0	0	0	0	0	0	1	1
LINE - BOGARD ST	4	0	0	0	0	0	0	0	0	0	0	0	2
BOGARD - SPRING ST	12	1	1	2	0	0	0	0	0	1	0	3	1
SPRING - CANON ST	18	0	5	1	0	0	0	0	2	0	0	2	1
CANON - MORRIS ST	4	0	1	0	0	0	0	0	0	0	0	0	0
MORRIS - RADCLIFFE ST	29	0	2	1	1	0	0	0	0	2	1	3	2
RADCLIFFE - WARREN ST	14	0	0	1	0	0	0	0	0	0	2	1	1
WARREN - VANDERHORST ST	14	0	0	0	0	0	0	0	0	0	0	3	1
VANDERHORST - CALHOUN ST	9	0	2	1	1	0	0	1	0	0	0	0	0
CALHOUN - GEORGE ST	22	1	2	1	0	0	1	0	0	0	1	1	1
Grand Total	133	3	14	7	2	0	1	1	2	3	4	14	10
% of Total		2.26%	10.53%	5.26%	1.50%	0.00%	0.75%	0.75%	1.50%	2.26%	3.01%	10.53%	7.52%

**TABLE C
SAINT PHILIP ST CRASH SUMMARY
HOURLY TRENDS**

Block	Crashes in Section	# Crashes 12pm-1pm	# Crashes 1pm-2pm	# Crashes 2pm-3pm	# Crashes 3pm-4pm	# Crashes 4pm-5pm	# Crashes 5pm-6pm	# Crashes 6pm-7pm	# Crashes 7pm-8pm	# Crashes 8pm-9pm	# Crashes 9pm-10pm	# Crashes 10pm-11pm	# Crashes 11pm-12am
SHEPPARD - LINE ST	7	1	2	0	0	0	0	0	0	0	0	0	0
LINE - BOGARD ST	4	0	0	0	1	0	0	0	0	1	0	0	0
BOGARD - SPRING ST	12	0	0	0	0	1	1	0	1	0	0	0	0
SPRING - CANON ST	18	0	0	1	0	3	2	0	1	0	0	0	0
CANON - MORRIS ST	4	1	0	0	0	1	1	0	0	0	0	0	0
MORRIS - RADCLIFFE ST	29	3	0	0	2	2	1	1	1	1	1	1	4
RADCLIFFE - WARREN ST	14	0	0	1	0	2	1	2	0	0	0	1	2
WARREN - VANDERHORST ST	14	0	3	1	0	2	2	0	1	0	0	1	0
VANDERHORST - CALHOUN ST	9	0	0	0	0	0	0	1	0	0	1	2	0
CALHOUN - GEORGE ST	22	1	1	1	3	2	0	0	3	1	0	1	1
Grand Total	133	6	6	4	6	13	8	4	7	3	2	6	7
% of Total		4.51%	4.51%	3.01%	4.51%	9.77%	6.02%	3.01%	5.26%	2.26%	1.50%	4.51%	5.26%

Appendix B AERIAL CRASH EXHIBITS



CRASH TYPE

ANGLE CRASH: 4 SIDESWIPE CRASH: 3
 REAR END CRASH: 0 OTHER CRASH: 4

BICYCLE AND PEDESTRIAN

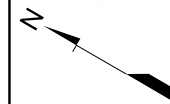
BICYCLE: 1
 PEDESTRIANS: 0

ROAD CONDITIONS

WET: 1
 DRY: 10

SEVERITY

PDO: 9
 INJURY: 2
 FATAL: 0



SAINT PHILIP ST
 SAFETY IMPROVEMENTS
 BLOCK: SHEPPARD -
 BOGARD ST
 SCALE: 1"=100'
 SHEET 1 OF 9



MATCHLINE
SEE SHEET 2

BOGARD STREET

S-10-106 (SAINT PHILIP STREET)

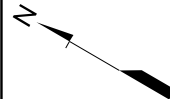
SPRING STREET (S-10-3)

SAINT PHILIP STREET

**S-10-1037
(CANNON STREET)**

S-10-1037 (CANNON STREET)

MATCHLINE
SEE SHEET 3



CRASH TYPE

ANGLE CRASH: 7

SIDESWIPE CRASH: 14

REAR END CRASH: 4

OTHER CRASH: 5

BICYCLE AND PEDESTRIAN

BICYCLE: 0
PEDESTRIANS: 0

ROAD CONDITIONS

WET: 5
DRY: 25

SEVERITY

PDO: 25
INJURY: 5
FATAL: 0

SAINT PHILIP ST
SAFETY IMPROVEMENTS
BLOCK: BOGARD -
CANON ST
SCALE: 1"=100'
SHEET 2 OF 9



MATCHLINE
SEE SHEET 2

S-10-1037 (CANNON STREET)

S-10-106 (SAINT PHILIP STREET)

S-10-564 (MARY STREET)

S-10-564 (MORRIS STREET)

MATCHLINE
SEE SHEET 4

CRASH TYPE

ANGLE CRASH: 1

SIDESWIPE CRASH: 1

REAR END CRASH: 0

OTHER CRASH: 2

BICYCLE AND PEDESTRIAN

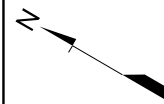
BICYCLE: 0
PEDESTRIANS: 0

ROAD CONDITIONS

WET: 1
DRY: 3

SEVERITY

PDO: 4
INJURY: 0
FATAL: 0



SAINT PHILIP ST
SAFETY IMPROVEMENTS
BLOCK: CANON - MORRIS ST

SCALE: 1"=100'
SHEET 3 OF 9



CRASH TYPE

ANGLE CRASH: 14 SIDESWIPE CRASH: 4
 REAR END CRASH: 2 OTHER CRASH: 9

BICYCLE AND PEDESTRIAN

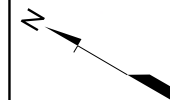
BICYCLE: 3
 PEDESTRIANS: 1

ROAD CONDITIONS

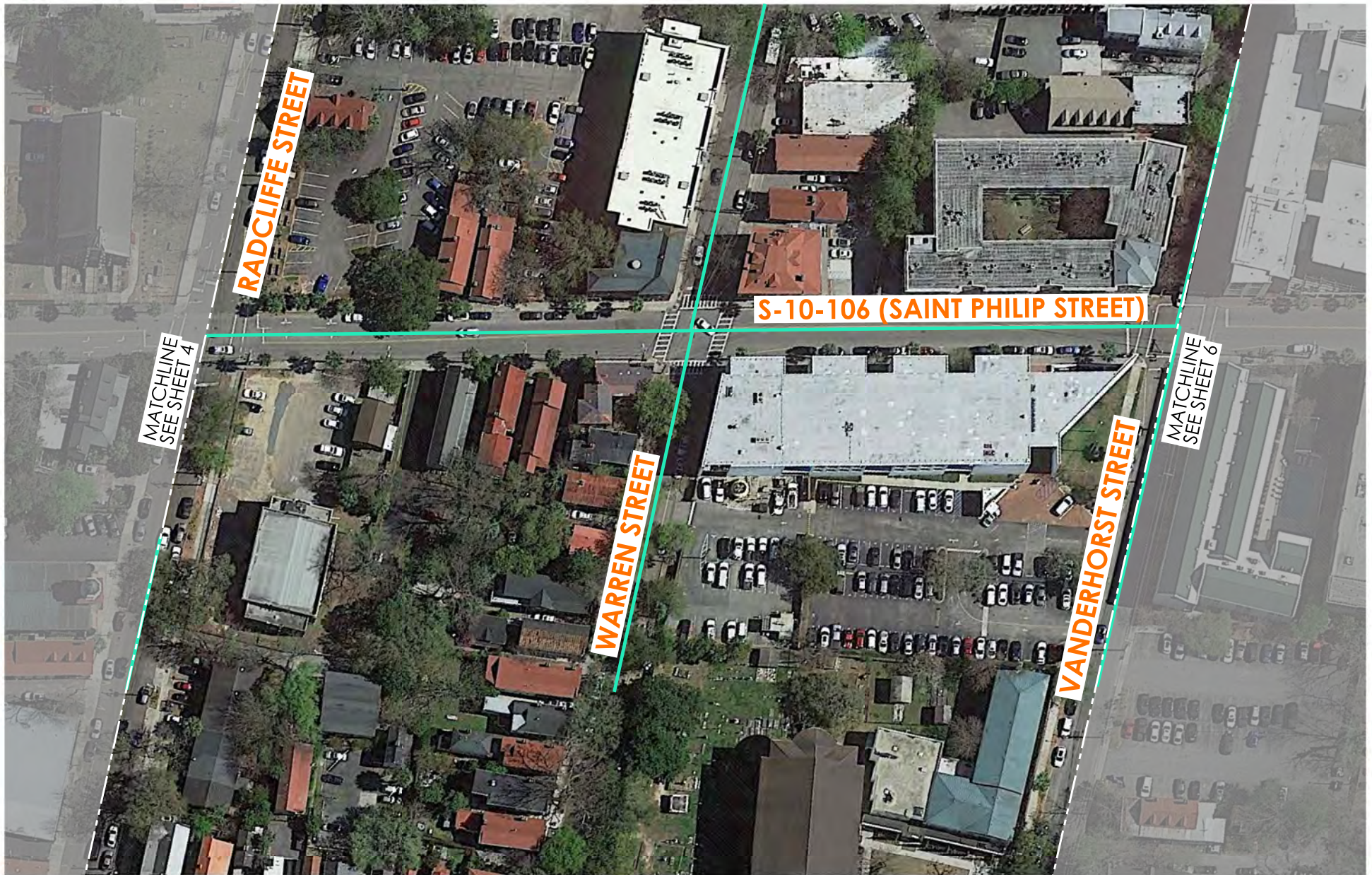
WET: 3
 DRY: 26

SEVERITY

PDO: 20
 INJURY: 9
 FATAL: 0



SAINT PHILIP ST
 SAFETY IMPROVEMENTS
 BLOCK: MORRIS -
 RADCLIFFE ST
 SCALE: 1"=100'
 SHEET 4 OF 9



CRASH TYPE

ANGLE CRASH: 16

SIDESWIPE CRASH: 3

REAR END CRASH: 0

OTHER CRASH: 9

BICYCLE AND PEDESTRIAN

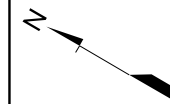
BICYCLE: 1
PEDESTRIANS: 3

ROAD CONDITIONS

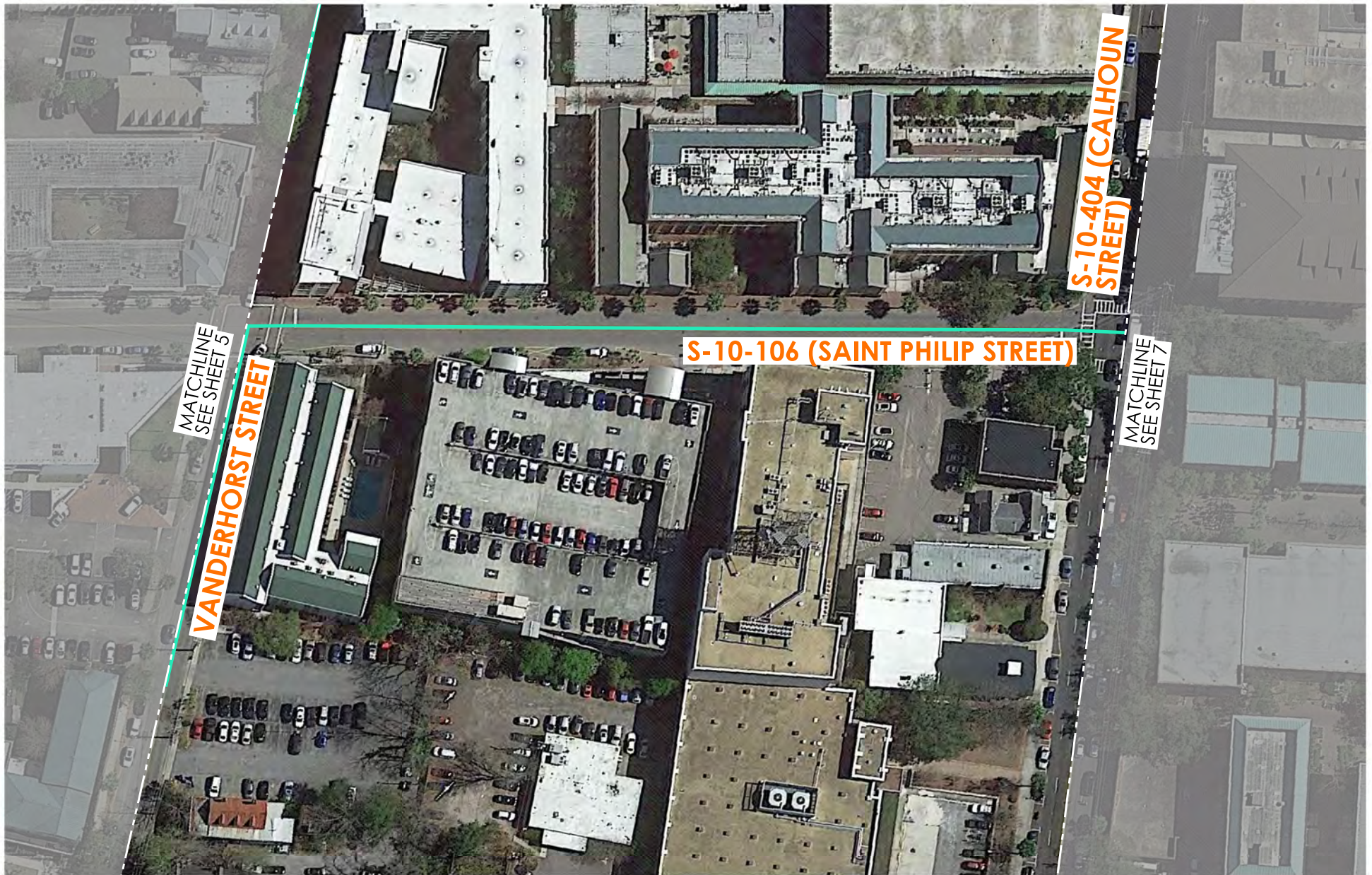
WET: 4
DRY: 23

SEVERITY

PDO: 19
INJURY: 9
FATAL: 0



SAINT PHILIP ST
SAFETY IMPROVEMENTS
BLOCK: RADCLIFFE -
VANDERHORST ST
SCALE: 1"=100'
SHEET 5 OF 9



CRASH TYPE

ANGLE CRASH: 1 SIDESWIPE CRASH: 5
 REAR END CRASH: 1 OTHER CRASH: 2

BICYCLE AND PEDESTRIAN

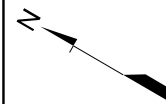
BICYCLE: 0
 PEDESTRIANS: 0

ROAD CONDITIONS

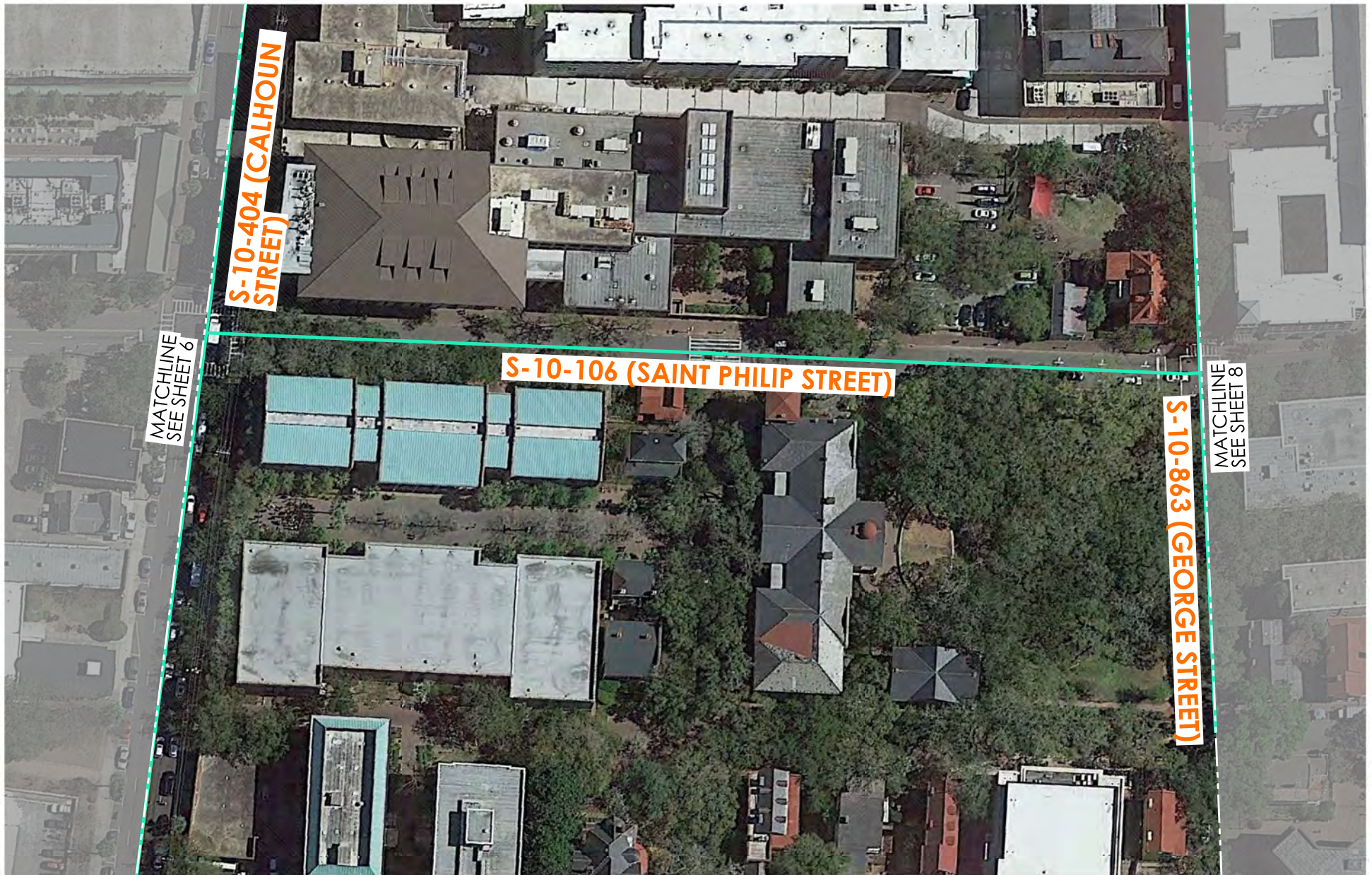
WET: 4
 DRY: 5

SEVERITY

PDO: 8
 INJURY: 1
 FATAL: 0



SAINT PHILIP ST
 SAFETY IMPROVEMENTS
 BLOCK: VANDERHORST ST -
 CALHOUN ST
 SCALE: 1"=100'
 SHEET 6 OF 9



S-10-404 (CALHOUN STREET)

S-10-106 (SAINT PHILIP STREET)

S-10-863 (GEORGE STREET)

MATCHLINE
SEE SHEET 6

MATCHLINE
SEE SHEET 8

SAINT PHILIP ST
SAFETY IMPROVEMENTS
BLOCK: CALHOUN -
GEORGE ST
SCALE: 1"=100'
SHEET 7 OF 9

CRASH TYPE

ANGLE CRASH: 3 SIDESWIPE CRASH: 7
REAR END CRASH: 4 OTHER CRASH: 8

BICYCLE AND PEDESTRIAN

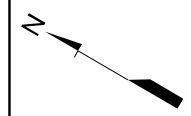
BICYCLE: 1
PEDESTRIANS: 2

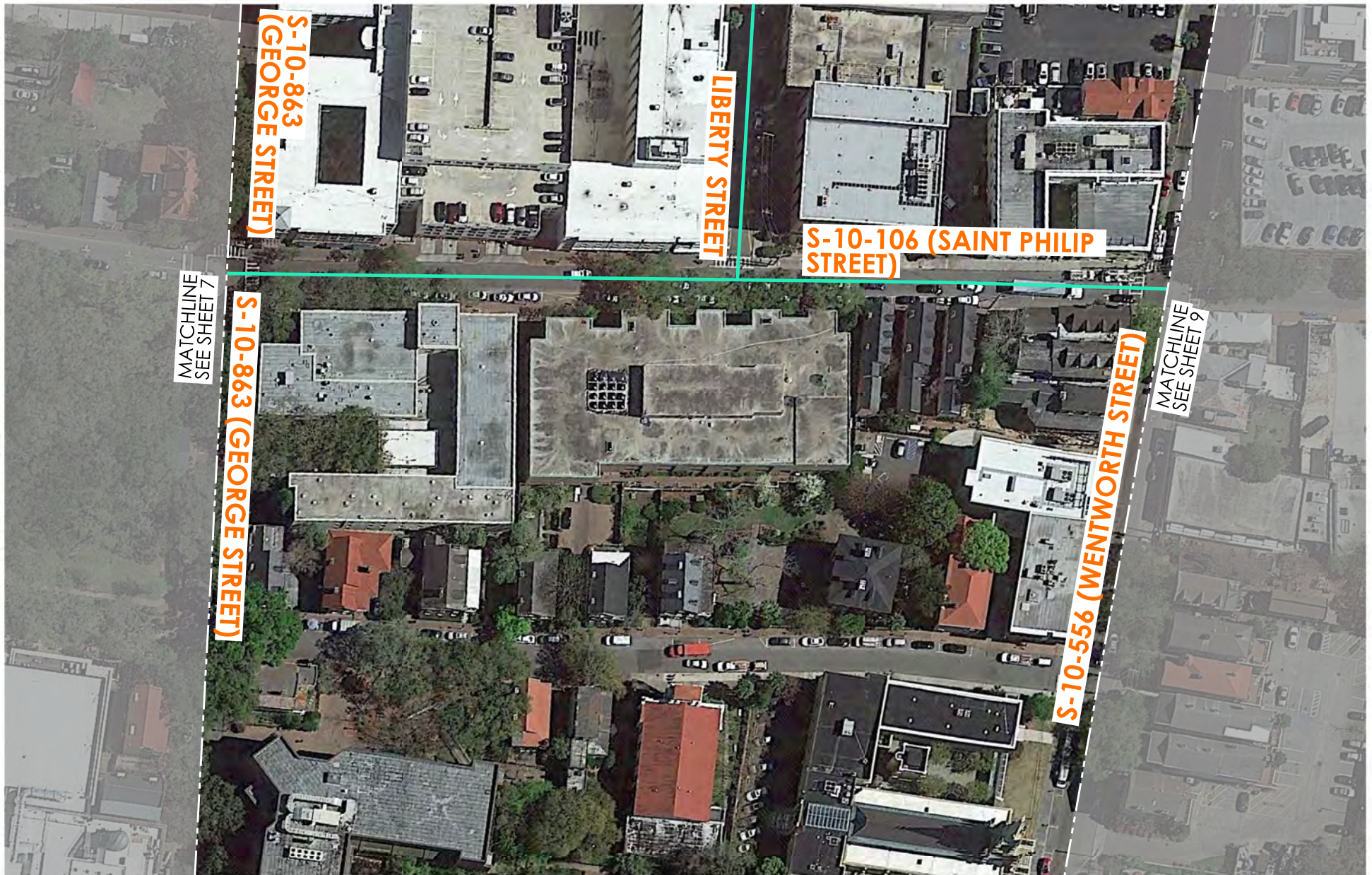
ROAD CONDITIONS

WET: 4
DRY: 18

SEVERITY

PDO: 15
INJURY: 7
FATAL: 0





CRASH TYPE

ANGLE CRASH: 0 SIDESWIPE CRASH: 0
 REAR END CRASH: 0 OTHER CRASH: 0

BICYCLE AND PEDESTRIAN

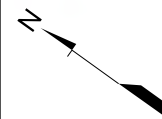
BICYCLE: 0
 PEDESTRIANS: 0

ROAD CONDITIONS

WET: 0
 DRY: 0

SEVERITY

PDO: 0
 INJURY: 0
 FATAL: 0



SAINT PHILIP ST
 SAFETY IMPROVEMENTS
 BLOCK: GEORGE ST -
 WENTWORTH ST
 SCALE: 1"=100'
 SHEET 8 OF 9



CRASH TYPE

ANGLE CRASH: 0 SIDESWIPE CRASH: 0
 REAR END CRASH: 0 OTHER CRASH: 0

BICYCLE AND PEDESTRIAN

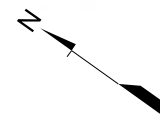
BICYCLE: 0
 PEDESTRIANS: 0

ROAD CONDITIONS

WET: 0
 DRY: 0

SEVERITY

PDO: 0
 INJURY: 0
 FATAL: 0



SAINT PHILIP ST
 SAFETY IMPROVEMENTS
 BLOCK: WENTWORTH ST -
 BEAUFAIN ST
 SCALE: 1"=100'
 SHEET 9 OF 9

Appendix C CRASH DIAGRAMS- SPECIFIC INTERSECTIONS



LEGEND

DSS - Disregarded Sign or Signal
 Inatt - Inattention
 DTFPC - Driving Too Fast for Conditions
 FYRW - Failure to Yield Right of Way
 ROR - Ran off Road
 FTC - Followed Too Closely
 AOV - Aggressive Operation of Vehicle
 SAO - Swerving to Avoid Object
 DUI - Under the Influence
 Imp LC - Improper Lane Change

RA = Right Angle
 RE = Rear End
 SS = Side Swipe
 HO = Head On
 OC = Out of Control
 HA = Hit Animal
 OTH = Other

YR	2016	2017	2018	2019	Total
RA	3	5	1	0	9
RE	1	0	0	0	1
SS	1	1	1	0	3
HO	0	0	0	0	0
OC	0	0	0	0	0
HA	0	0	0	0	0
OTH	0	0	0	0	0
Total	5	6	2	0	13

Night - 5
 Day - 8
 Wet - 1
 Dry - 12

Total = 13
 AADT = 4200
 Years = 3.75
 01/01/16 - 09/30/19
 CR = 2.261
 SI = 2.609

PDO - 12
 Inj. 1 - 0
 Inj. 2 - 1
 Inj. 3 - 0
 Fatal - 0

SCDOT TRAFFIC ENGINEERING DIVISION
 South Carolina Department of Transportation
 COLUMBIA, S.C.
TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: **Collision Diagram**
 SPECIFIC LOCATION: **S-106 (ST PHILLIPS ST) & RADCLIFFE ST**

CITY: **Charleston** COUNTY: **Charleston**

DRAWN BY: WWB	DATE: 02/26/2020	SCALE: None	PAGE: 1 of 1
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LEGEND

DSS - Disregarded Sign or Signal
Inatt - Inattention
DTFFC - Driving Too Fast for Conditions
FYRW - Failure to Yield Right of Way
ROR - Ran off Road
FTC - Followed Too Closely
AOV - Aggressive Operation of Vehicle
SAO - Swerving to Avoid Object
DUI - Under the Influence
Imp LC - Improper Lane Change

RA = Right Angle
RE = Rear End
SS = Side Swipe
HO = Head On
OC = Out of Control
HA = Hit Animal
OTH = Other

YR	2016	2017	2018	2019	Total
RA	1	1	0	1	3
RE	1	0	2	2	5
SS	2	6	1	1	10
HO	0	0	0	0	0
OC	0	0	0	0	0
HA	0	0	0	0	0
OTH	0	1	1	0	2
Total	4	8	4	4	20

Total = 20	AADT = 9100	Years = 3.75	PDO = 17
01/01/16 - 09/30/19	CR = 1.606	SI = 2.087	Inj. 1 - 2
Night - 11			Inj. 2 - 1
Day - 9			Inj. 3 - 0
Wet - 3			Fatal - 0
Dry - 17			

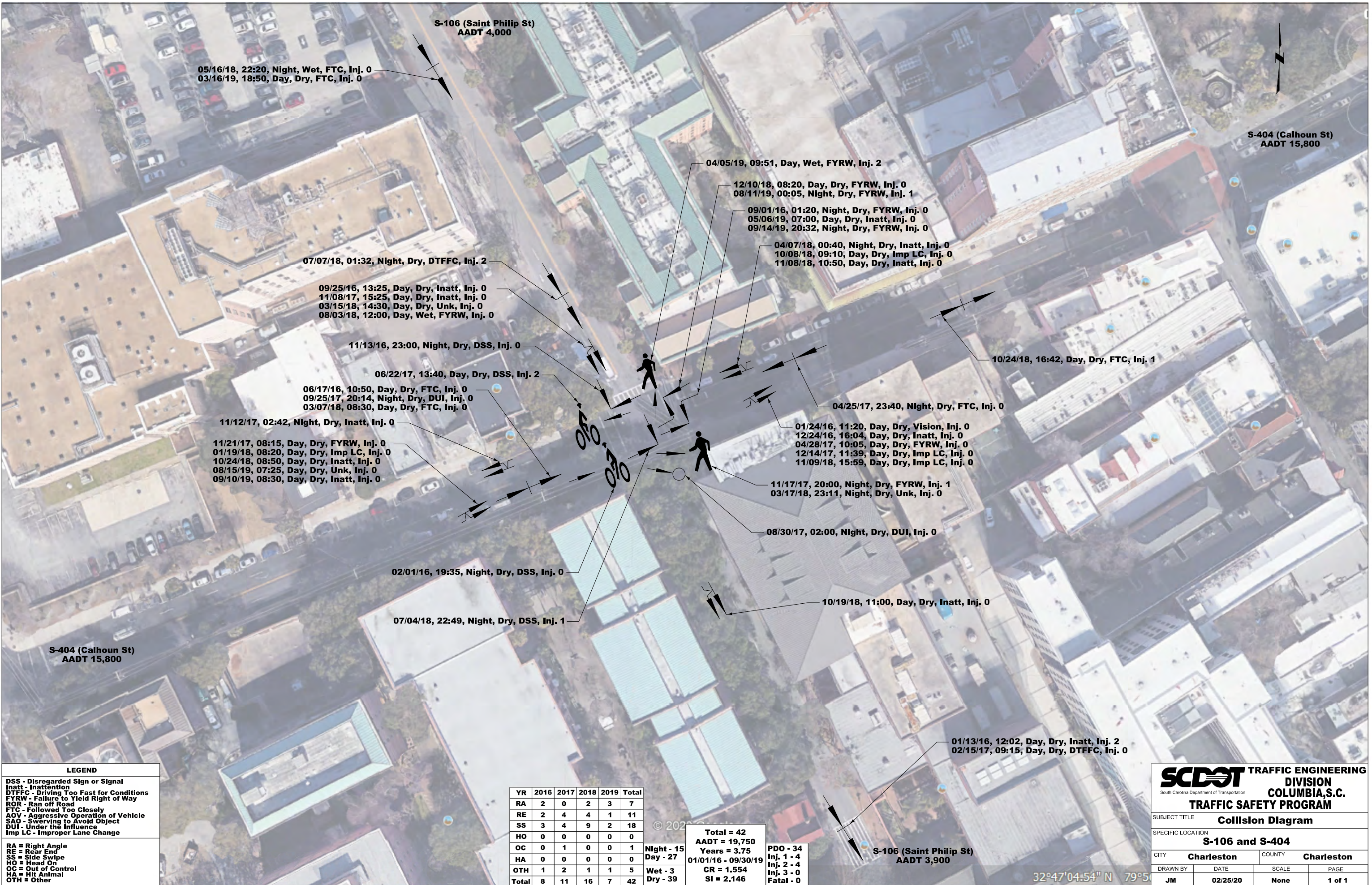
SCDOT TRAFFIC ENGINEERING DIVISION
South Carolina Department of Transportation
COLUMBIA, S.C.
TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: **Collision Diagram**

SPECIFIC LOCATION: **S-106 (ST PHILLIPS ST) & S-3 (SPRINGS ST)**

CITY: **Charleston** COUNTY: **Charleston**

DRAWN BY	DATE	SCALE	PAGE
WWB	02/26/2020	None	1 of 1



05/16/18, 22:20, Night, Wet, FTC, Inj. 0
03/16/19, 18:50, Day, Dry, FTC, Inj. 0

S-106 (Saint Philip St)
AADT 4,000

S-404 (Calhoun St)
AADT 15,800

04/05/19, 09:51, Day, Wet, FYRW, Inj. 2

12/10/18, 08:20, Day, Dry, FYRW, Inj. 0
08/11/19, 00:05, Night, Dry, FYRW, Inj. 1

09/01/16, 01:20, Night, Dry, FYRW, Inj. 0
05/06/19, 07:00, Day, Dry, Inatt, Inj. 0
09/14/19, 20:32, Night, Dry, FYRW, Inj. 0

04/07/18, 00:40, Night, Dry, Inatt, Inj. 0
10/08/18, 09:10, Day, Dry, Imp LC, Inj. 0
11/08/18, 10:50, Day, Dry, Inatt, Inj. 0

07/07/18, 01:32, Night, Dry, DTFFC, Inj. 2

09/25/16, 13:25, Day, Dry, Inatt, Inj. 0
11/08/17, 15:25, Day, Dry, Inatt, Inj. 0
03/15/18, 14:30, Day, Dry, Unk, Inj. 0
08/03/18, 12:00, Day, Wet, FYRW, Inj. 0

11/13/16, 23:00, Night, Dry, DSS, Inj. 0

06/22/17, 13:40, Day, Dry, DSS, Inj. 2

06/17/16, 10:50, Day, Dry, FTC, Inj. 0
09/25/17, 20:14, Night, Dry, DUI, Inj. 0
03/07/18, 08:30, Day, Dry, FTC, Inj. 0

11/12/17, 02:42, Night, Dry, Inatt, Inj. 0

11/21/17, 08:15, Day, Dry, FYRW, Inj. 0
01/19/18, 08:20, Day, Dry, Imp LC, Inj. 0
10/24/18, 08:50, Day, Dry, Inatt, Inj. 0
08/15/19, 07:25, Day, Dry, Unk, Inj. 0
09/10/19, 08:30, Day, Dry, Inatt, Inj. 0

01/24/16, 11:20, Day, Dry, Vision, Inj. 0
12/24/16, 16:04, Day, Dry, Inatt, Inj. 0
04/28/17, 10:05, Day, Dry, FYRW, Inj. 0
12/14/17, 11:39, Day, Dry, Imp LC, Inj. 0
11/09/18, 15:59, Day, Dry, Imp LC, Inj. 0

04/25/17, 23:40, Night, Dry, FTC, Inj. 0

11/17/17, 20:00, Night, Dry, FYRW, Inj. 1
03/17/18, 23:11, Night, Dry, Unk, Inj. 0

08/30/17, 02:00, Night, Dry, DUI, Inj. 0

10/19/18, 11:00, Day, Dry, Inatt, Inj. 0

02/01/16, 19:35, Night, Dry, DSS, Inj. 0

07/04/18, 22:49, Night, Dry, DSS, Inj. 1

S-404 (Calhoun St)
AADT 15,800

01/13/16, 12:02, Day, Dry, Inatt, Inj. 2
02/15/17, 09:15, Day, Dry, DTFFC, Inj. 0

S-106 (Saint Philip St)
AADT 3,900

32°47'04.54" N 79°5'

LEGEND

DSS - Disregarded Sign or Signal
Inatt - Inattention
DTFFC - Driving Too Fast for Conditions
FYRW - Failure to Yield Right of Way
ROR - Ran off Road
FTC - Followed Too Closely
AOV - Aggressive Operation of Vehicle
SAO - Swerving to Avoid Object
DUI - Under the Influence
Imp LC - Improper Lane Change

RA = Right Angle
RE = Rear End
SS = Side Swipe
HO = Head On
OC = Out of Control
HA = Hit Animal
OTH = Other

YR	2016	2017	2018	2019	Total
RA	2	0	2	3	7
RE	2	4	4	1	11
SS	3	4	9	2	18
HO	0	0	0	0	0
OC	0	1	0	0	1
HA	0	0	0	0	0
OTH	1	2	1	1	5
Total	8	11	16	7	42

© 2020

Total = 42
AADT = 19,750
Years = 3.75
01/01/16 - 09/30/19
CR = 1.554
SI = 2.146

PDO - 34
Inj. 1 - 4
Inj. 2 - 4
Inj. 3 - 0
Fatal - 0

Night - 15
Day - 27
Wet - 3
Dry - 39

SCDOT TRAFFIC ENGINEERING DIVISION
South Carolina Department of Transportation
COLUMBIA, S.C.
TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: **Collision Diagram**

SPECIFIC LOCATION: **S-106 and S-404**

CITY: Charleston	COUNTY: Charleston
DRAWN BY: JM	DATE: 02/25/20
SCALE: None	PAGE: 1 of 1



LEGEND

DSS - Disregarded Sign or Signal
 Inatt - Inattention
 DTFC - Driving Too Fast for Conditions
 FYRW - Failure to Yield Right of Way
 ROR - Ran off Road
 FTC - Followed Too Closely
 AOV - Aggressive Operation of Vehicle
 SAO - Swerving to Avoid Object
 DUI - Under the Influence
 Imp LC - Improper Lane Change

RA = Right Angle
 RE = Rear End
 SS = Side Swipe
 HO = Head On
 OC = Out of Control
 HA = Hit Animal
 OTH = Other

YR	2014	2015	2016	2017	Total
RA	7	5	3	2	17
RE	2	1	1	0	4
SS	3	0	0	1	4
HO	0	0	0	0	0
OC	0	0	0	0	0
HA	0	0	0	0	0
OTH	0	0	0	0	0
Total	12	6	4	3	25

Total = 25
AADT = 5325
Years = 3.50
01/01/14 - 06/30/17
CR = 3.675
SI = 4.557

Night - 4
Day - 21

Wet - 5
Dry - 20

PDO - 22
Inj. 1 - 2
Inj. 2 - 1
Inj. 3 - 0
Fatal - 0

SCDOT TRAFFIC ENGINEERING
 South Carolina Department of Transportation
 DIVISION
COLUMBIA, S.C.
TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: **Collision Diagram**

SPECIFIC LOCATION: **S-106 & S-863**

CITY	Charleston	COUNTY	Charleston
DRAWN BY	REW	SCALE	None
DATE	02/16/17	PAGE	1 of 1

LEGEND
DSS - Disregarded Sign or Signal
Inatt - Inattention
DTFFC - Driving Too Fast for Conditions
FYRW - Failure to Yield Right of Way
ROR - Ran off Road
FTC - Followed Too Closely
AOV - Aggressive Operation of Vehicle
SAO - Swerving to Avoid Object
DUI - Under the Influence
Imp LC - Improper Lane Change

RA = Right Angle
RE = Rear End
SS = Side Swipe
HO = Head On
OC = Out of Control
HA = Hit Animal
OTH = Other



YR	2016	2017	2018	2019	Total
RA	1	2	2	0	5
RE	0	2	0	0	2
SS	0	0	0	0	0
HO	0	0	0	0	0
OC	0	0	0	0	0
HA	0	0	0	0	0
OTH	0	0	0	0	0
Total	1	4	2	0	7

Total = 7
AADT = 4000
Years = 3.75
01/01/16 - 09/30/19
CR = 1,279
SI = 2.009

PDO - 5
Inj. 1 - 1
Inj. 2 - 1
Inj. 3 - 0
Fatal - 0

Night - 1
Day - 6
Wet - 2
Dry - 4

SCDOT TRAFFIC ENGINEERING DIVISION
South Carolina Department of Transportation
COLUMBIA, S.C.
TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: **Collision Diagram**

SPECIFIC LOCATION: **S-106 & Warren St.**

CITY	Charleston	COUNTY	Charleston
DRAWN BY	REW	SCALE	None
DATE	02/27/19	PAGE	1 of 1

Appendix D CRASH DIAGRAMS- BICYCLE AND PEDESTRIANS



LEGEND

DSS - Disregarded Sign or Signal
 Imp - Improper Lane Change
 DTFCC - Driving Too Fast for Conditions
 FTYRW - Failure to Yield Right of Way
 RE - Rear End Collision
 FTC - Followed Too Closely
 AOV - Aggressive Operation of Vehicle
 AOD - Swerving to Avoid Object
 DUI - Driving Under the Influence
 Imp LC - Improper Lane Change

RA = Right Angle
 NA = Not a Crash
 SS = Side Swipe
 HC = Head On
 OTH = Other

YR	2012	2013	2014	2015	2016	2017	2018	Total
RA	0	0	0	0	0	0	0	0
RE	0	0	0	0	0	0	0	0
SS	0	0	0	0	0	0	0	0
HO	0	0	0	0	0	0	0	0
OC	0	0	0	0	0	0	0	0
NA	0	0	0	0	0	0	0	0
OTH	4	4	1	1	1	3	1	15
Total	4	4	1	1	1	3	1	15

Total = 15	PDO - 2
Length = 1.07	Inj. 1 - 9
AAADT = 7537	Inj. 2 - 4
Years = 6.25	Inj. 3 - 0
01/01/12 - 03/31/18	Fatal - 0
CR = 0.815	
SI = 2.229	

SCDOT TRAFFIC ENGINEERING
 South Carolina Department of Transportation
 DIVISION COLUMBIA, S.C.
 TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: BIKE & PED ONLY
 SPECIFIC LOCATION: S-106 (MP 0.0 - 1.07)

CITY	Charleston	COUNTY	Charleston
DRAWN BY	WWB	DATE	09/18/18
SCALE	None	PAGE	1 of 2



TRAFFIC ENGINEERING DIVISION COLUMBIA, S.C. TRAFFIC SAFETY PROGRAM			
SUBJECT TITLE BIKE & PED ONLY			
SPECIFIC LOCATION S-106 (MP 0.0 - 1.07)			
CITY	DATE	COUNTY	PAGE
Charleston	09/18/18	Charleston	2 of 2
DRAWN BY	SCALE		
WWB	None		

Appendix E **BENEFIT-COST ANALYSIS**

Benefit / Cost Analysis Summary Table				
S-106 St. Philip Street				
<u>Corridor Improvements</u>				
	Annual Cost	Annual Benefit	Net Benefit	B/C
Create a bicycle boulevard	\$3,961	\$39,342	\$35,381	9.93
South of Calhoun Street- Add bicycle track and reduce S-106 to one travel lane	\$6,482	\$44,755	\$38,273	6.90
North of Calhoun Street*- Add Bicycle track and convert S-106 to one lane, one way street	\$25,207	\$68,944	\$43,737	2.74
Add crosswalks to side street approaches. (Approx. 2 approaches)	\$402	\$0	-\$402	<1
Upgrade side street crosswalks to ladder style (9 approaches)	\$1,741	\$0	-\$1,741	<1
Add detectable warning surfaces to ADA ramps at signalized and unsignalized side street crossings. (Approx. 4 ramps)	\$144	N/A	N/A	N/A
Implement leading Pedestrian Intervals (LPIs) with ped push buttons (Approx. 7 signals)	\$5,546	\$42,815	\$37,270	7.72
Upgrade pavement markings and raised pavement markers (see note 1)	N/A			
Clean s/w and ramps of debris;Trim overgrown vegetation and trees	N/A	N/A	N/A	N/A
Repair damaged sidewalks and ramps	\$3,601	N/A	N/A	N/A
Replace existing drop inlet grates to bicycle friendly grates. (Approx. 15 grates)	\$576	N/A	N/A	N/A
Install uniform street lighting to enhance pedestrian safety	TBD			
Install retroreflective backplates to improve signal head visibility. (Approx. 7 locations)	\$1,647	\$64,223	\$62,575	38.99
Replace 8" signal heads with 12" signal heads, as per MUTCD. (Approx. 7 intersections)	\$9,219	\$42,815	\$33,597	4.64
Install pedestrian signal heads and countdowns (Approx. 2 locations)	\$2,521	\$21,504	\$18,983	8.53
<u>Intersection Specific Improvements</u>				
	Annual Cost	Annual Benefit	Net Benefit	B/C
Bogard St. - Curb extension at NW and SW corners. Add raised crosswalk @ northern approach of S-106	\$3,313	N/A	N/A	N/A
Spring St. – Construct curb extensions at all corners	\$6,482	N/A	N/A	N/A
Cannon St. – Curb extensions at three corners	\$4,177	N/A	N/A	N/A
Morris St. – Curb extensions at three corners	\$4,177	N/A	N/A	N/A
Radcliffe St. – Reconstruct ramps to align with crosswalk or relocate crosswalk at the SW corner. Relocate signal cabinet and utility pole.	\$4,321	N/A	N/A	N/A
Warren St. – Reconstruct ramps to align with crosswalks or relocate crosswalks at the SW, NW, & NE corners . Construct raised intersection. (See note 2)	\$9,363	\$0	-\$9,363	<1
Vanderhorst St - Install high vis. mid-block crosswalk w/ appropriate signage between Vanderhorst and Calhoun St.	\$8,034	\$20,160	\$12,126	2.51
Calhoun St. – Add an all pedestrian scramble signal phase. Reconstruct ramps to align w crosswalk or relocate crosswalk at SW corner. Increase pedestrian storage all adjacent parcels.	\$4,321	\$21,954	\$17,633	5.08
Green Way - Replace flashing beacons with RRFB. Raise the mid-block crosswalk. (See Note 2)	\$3,241	\$0	-\$3,241	<1
George St. – Repair damaged detectable warning surface at the northeast corner	\$1,440	N/A	N/A	N/A

Notes:

1. Cost for pavement marking upgrades are included with other items, so no B/C ratio is derived.
2. Intersection specific improvements at Warren Street and Green Way do not show B/C ratios because no crashes occurred there. But the recommendations do provide safety benefits.